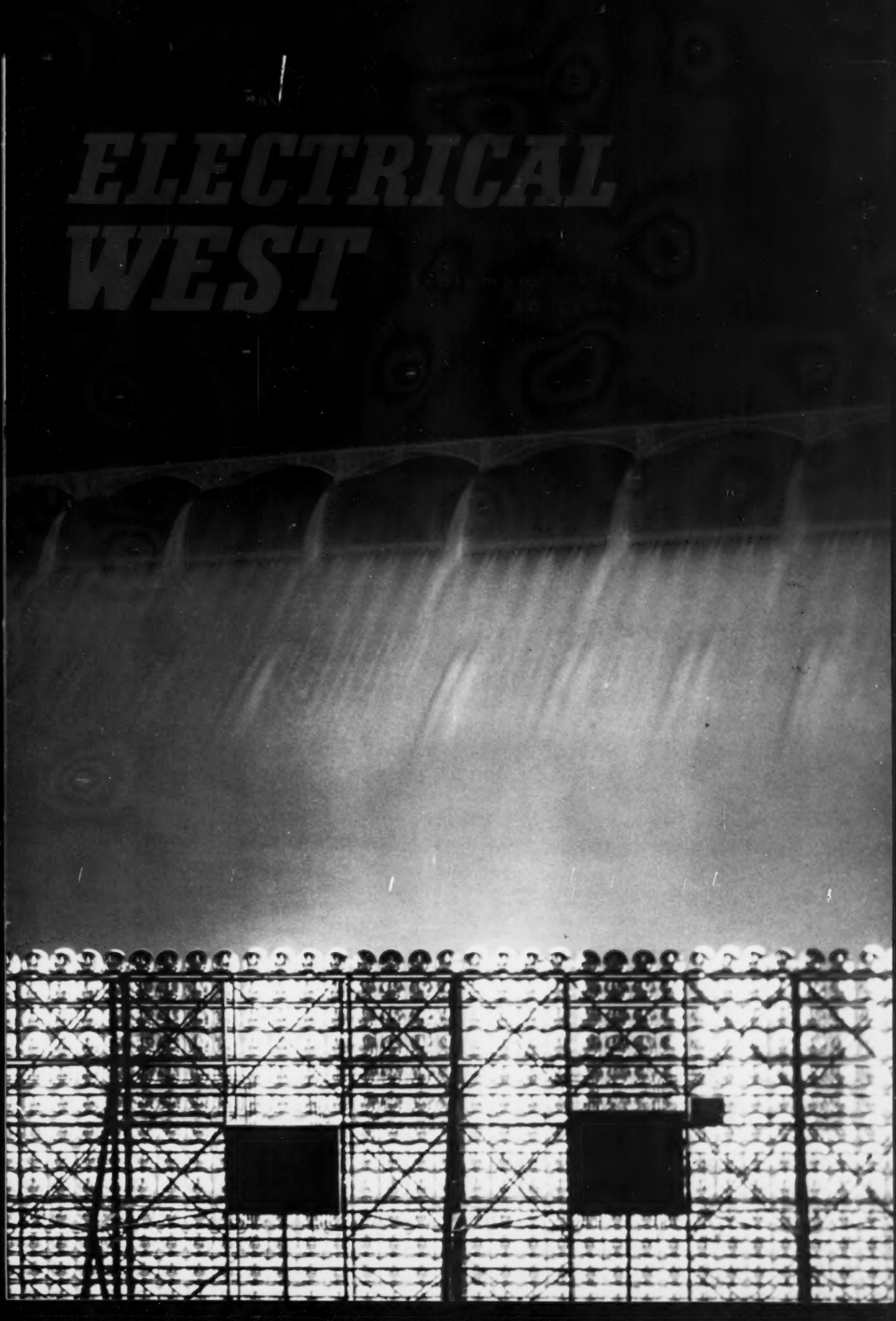
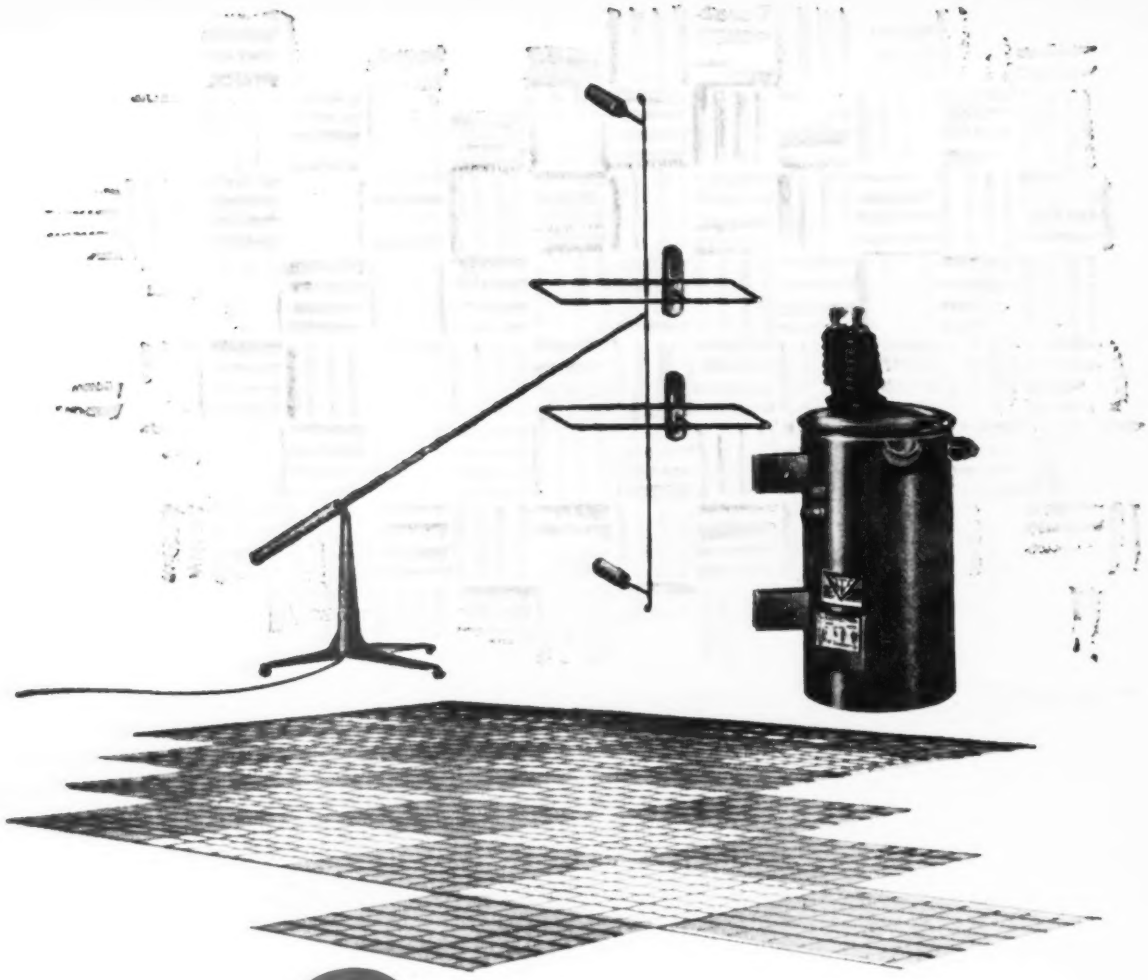
ELECTRICAL WEST





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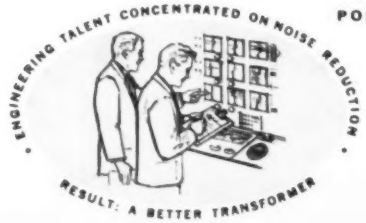

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More Preference— Because most Americans have an ingrained aversion to "free loaders," it is well to keep a weather eye on Congress for the greatest free loaders in history are diligently at work. The latest effort to dissipate taxpayers' funds is a bill (HR-8) which would charge off a larger share of the cost of federal water development projects to secondary uses. This would leave a smaller cost to be borne by the adjacent electric power customers and thereby give more preference to the few at the expense of many. **The net effect of these secondary user benefit charges would be to cut power facilities to approximately 50% of the total project cost.**

It is hoped that enough alert citizens will write their congressmen to protest this and all the other devious ways that congressmen are able to dream up to send this country into oblivion.

Plain Speaking— William C. Stolk, president of the American Can Co., said some important things that needed saying before a chemical meeting in Chicago earlier this year. He told the meeting very bluntly that American standards were being lowered, ideals were being downgraded, character was being weakened and American tradition submerged in the "fast buck" attitude.

The four freedoms that the nation has traditionally cherished are now being replaced by a new group: Freedom from Care, Freedom from Effort, Freedom from Responsibility and Freedom to Get without having to Give. In effect, Stolk said that independence was being replaced by irresponsibility; initiative by indulgence; and ambition degradated to organized mediocrity.

Stolk's remarks need echoing throughout the breadth and length of the land. One has to look around only a little to see where integrity has been replaced by self-interest, where indignation has succumbed to selfish complacency.

Civic lethargy plus an erosion of American principles have led this country down the primrose path that leads to only one place—a secondary and subservient world position. Under those circumstances—freedoms under any name become only abstract concepts.

Highway Benefits— Researchers at the University of Oregon have come up with a study that deals with the implications of the free use of highways by electric utilities for pole lines. It's one of the first studies that has been done in this field and its findings and conclusions are of interest. For example, there are estimated to be 4,726 miles of power lines located on or adjacent to the 8,841 miles of federal-aid highways in the state. Of this amount 3,212 miles are on highways.

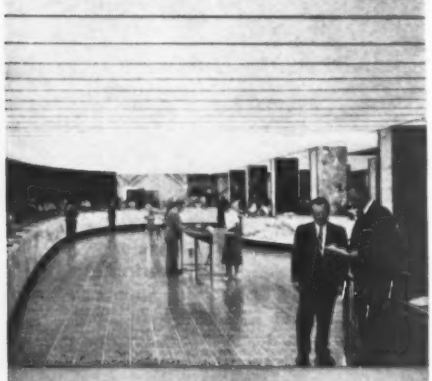
In estimating the benefits derived by the utilities, the study places the equivalent cost of an easement along a highway at $866 per mile on the average, which would bring the capital investment necessary to secure easements in place of highway use at a value of nearly $2,800,000. On this basis the annual cost of hiding easements, on a 6 to 8% rate of return, would be between $170,000 and $225,000.

Thus, the utilities do enjoy the equivalent of a monetary benefit from the use of highway land but, on the other hand, the cost of replacing this use with easements would result in an increase of cost to the electric utility customers. The study concludes that, inasmuch as the cost of having utility lines on the highway is virtually negligible to the state, the benefits of less land use, lower rates for the customers, less labor and construction and maintenance and other factors indicate that the system of permitting utilities to build along highways is sound economically from an over-all standpoint.

Those desiring a complete report may obtain it for $1 from Wesley C. Ballaine, director, Bureau of Business Research, University of Oregon.

Light for Under-River Tunnel . . 63

Packaged Units 67



Modernization Gives Light . . 74

Measure Shop Load 87

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S. Established 1887

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CONTENTS

VOL. 123, No. 3 SEPTEMBER 1959

ANNUAL LIGHTING ISSUE

Office Building Electrical Design by Walter G. Bavha 68
Shining Examples From the West 69
In a State of Light 76
220-V Lighting Saves in Schools 78
Penstock Heat Exchanger 81
20.8-Kv Primary Distribution by C. L. Brown and R. C. Martin 82
Saline Water Conversion by R. E. Whistler 84
Electric Heat Keeps Metal Flowing by Albert L. Stone 88
IAEL Meeting at San Diego 90

Cover—Grand Coulee Dam spillway waterfall, lighted by 756 color-filtered floodlights of 1,500 w each, phased to give 120 color combinations in each 30-minute program, is a spectacular tourist attraction.—Photo by U. S. Bureau of Reclamation.

DEPARTMENTS

Bulletins 25
Construction News 79
Editorials 1
News 106
News Roundup 6
Product News 15
Advertising Index 135, 137

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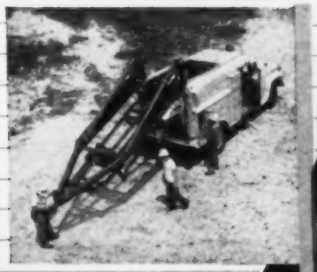

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Replacement of Obsolete Parts. Use of modern components to replace outdated parts before they fail will provide a great increase in reliability of units otherwise fit for continued service.

Use of New Accessories. The latest developments, such as gas detectors, help solve old operating problems and can be purchased at little cost.

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Westinghouse field service engineers will be glad to study your power transformers and recommend improvements to increase performance and reliability.

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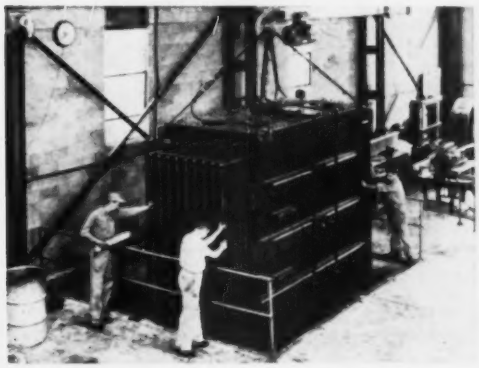

Power transformer is shown being lowered into pit for detanking in a Westinghouse M & R Plant. These plants can perform modernization operations which cannot be undertaken in the field.

Here, Westinghouse service engineers detank a power transformer in the field.

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EW

news roundup

IKE'S VETO? — Present Washington thinking is that President Eisenhower will veto the proposed public works appropriation bill for fiscal 1960.

The reason for this conjecture is that while Ike's annual budget message urged no new building starts the House version of the bill called for 44 new construction starts (ultimately costing $500 million) and the Senate version added 38 new starts (ultimate cost $700 million), including funds to start the controversial Trinity Dam power plant.

In a letter concerning the bill written to John Tabor (R-N.Y.) Ike said, "It is my firm judgment that the present and future welfare of the American people requires that the skyrocketing of federal spending be stopped. If we are to provide adequate security for our country, meet our domestic and international responsibilities, and still avoid the continuing inflation which results from higher and higher budget expenditures leading to deficits, we must avoid committing ourselves to larger and larger expenditures in future years. The fact that our commitments result in only relatively small increases in expenditures in 1960 seems to me immaterial. . . I sincerely hope that the Congress in appropriating for water resources projects will act responsible not only for fiscal 1960, but for future years as well."

—EW—

DREAM BILL HEARING—Oregon Senator Richard Neuberger's bill to create a Federal Power Corp. for the Pacific Northwest underwent two days of hearings before the Public Works subcommittee. The bill would greatly expand the responsibility of BPA, authorizing it to go into debt to the tune of $1.2 billion by issuing its own bonds for new construction.

Gus Norwood of the Northwest Public Power Assn. criticized the bill because (1) the new agency's general manager would be appointed by the board of directors, (2) the corporation could not condemn existing power dams, and (3) the criteria for interconnections with existing dams has been softened.

Speaking sharply against the bill, Montana Governor J. Hugo Aronson was quoted as saying, "The bill appears designed to hamper and destroy the efforts of any taxpaying, free enterprise agency which seeks to develop electric power in an orderly fashion."

Neuberger is now saying that the bill was for discussion only and he won't try for enactment for another year or so.

—EW—

The 1960 fiscal appropriation for REA will be $139 million plus a $25 million contingency fund and a $9.6 million fund for administration.

—EW—

WATER POWER PLANNINGS—A recent Commerce Department report estimates a total of $18.5 billion will be needed by 1975 for new federal and nonfederal hydro and steam power facilities. It is broken down this way: federal hydro $7.7 billion, nonfederal hydro $3.6 billion, federal thermal $.5 billion, nonfederal thermal $6.7 billion.

AT THE SAME TIME the Department of the Interior U. S. geological survey issued a report pointing to the possibility that maximum stream flow benefits from additional reservoir (and hydro power) construction may soon be reached if not already exceeded in certain basins —particularly in the West.

What's that about the right hand and the left hand?

AT THE SAME TIME the Senate select committee on national water resources met and agreed to start study into new and original methods of developing maximum river developments through management of multiple purpose projects. The group is negotiating with resources for The Future Inc. to carry out its studies of water requirements through 1980.

PARTNERSHIP PLAN DIES—The hotly contested Pacific Gas and Electric Co. Trinity River partnership proposal has been defeated in Washington. The PG and E plans, which would have added $320 billion in payment to the government over the repayment period, was scrapped in favor of the government project costing $60 million.

—EW—

The AEC hopes to come up with site criteria for the guidance of prospective reactor operators. Harold Price, chief of the AEC's division of licensing and regulations, has made it clear that development of written regulations setting forth specific safety criteria is a major goal.

To date, each case has been considered by AEC and its advisory committee on reactor safeguards on an individual basis.

The PG and E proposed nuclear station at Humboldt Bay still has this hurdle to pass.

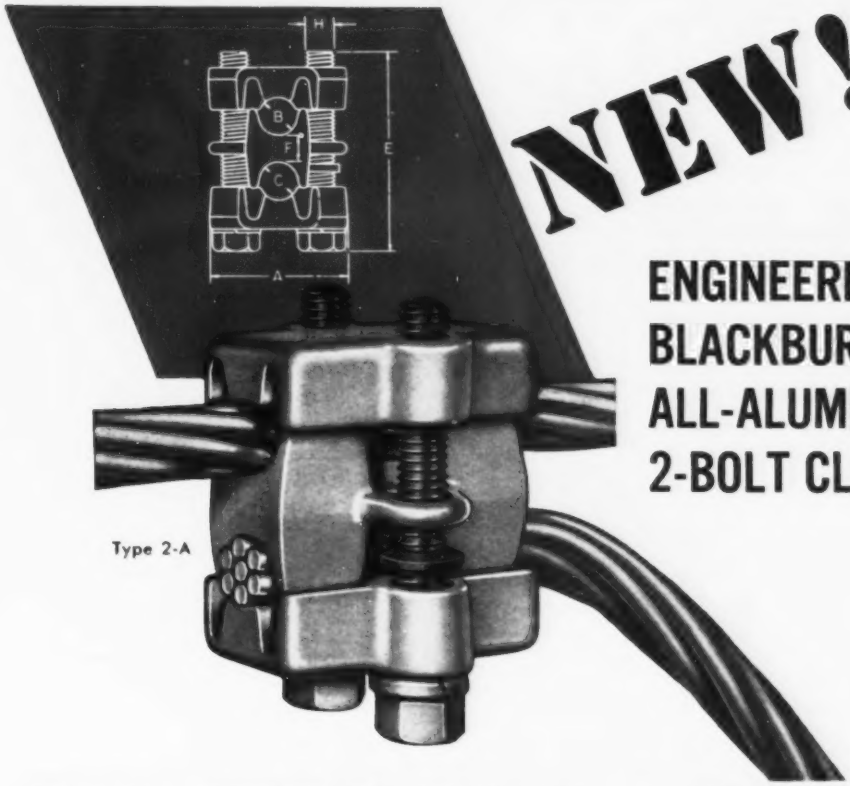
Some trial balloon safety factors issued in May were supposed to stimulate discussion by the industry. There were plenty. The commission hopes to incorporate the industry's comments and come up with a formal rule later this year. Meanwhile, the deadline for filing comments has been extended to mid-September.

—EW—

THE PROFS PAY — How do faculty members of four-year technological institutions fare salarywise? A recent survey of salaries covering 1958-59 indicates engineering faculty members' salaries as follows:

Deans	$13,300
Professors	9,700
Associate professors	7,400
Assistant professors	6,230
Instructors	4,890
Combined	6,960

Over-all salaries of full professors at private colleges rose 15.6% over



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the previous year, while public institutions' full professors' pay rose only 6%. In the recent report, "Higher Education Planning and Management Data, 1958-59," Arthur S. Fleming said that a doubling of college salaries in the next five to seven years would "make a major contribution to strengthening of our education system."

—EW—

The Federal Power Commission has revised upward its estimates of peak requirements for the electric industry by 1980. The present 1980 estimate is 366 million kw versus 120 million kw in 1958. The basis for the upward revision have been on increased population projections recently published by the Census Bureau. The revised forecasts are about 80% above last year's estimates despite the fact that power consumption was off badly during 1958.

—EW—

FACTS AND FIGURES – The median income for engineers participating in the 1958 income and salary survey sponsored by the NSPE was $10,000. With one-third of the engineers surveyed having less than 10 years of experience, the figure is impressive.

The survey showed the median for chemical engineers ($11,170) to be the highest and civil engineers ($9,620) as the lowest. Electricals and mechanicals stood in the middle with $10,270 and $10,250, respectively. (Median earnings by field of employment showed the public utilities to be below the $10,000 figure at $9,660. Respondents from consulting firms, industry and construction contractors were above the $10,000 level.)

Median earnings by region showed the West a shade above average.

—EW—

CONCENTRATION – The AEC, in line with its program to reduce the number of nuclear reactor concepts under development, has suspended indefinitely all research and developmental work on liquid sodium-cooled, heavy water-moderated power reactors. The decision, based on the results of a technical and economic study, indicated that the many technical problems, even if solved, would not lead to a reactor capable of producing power more cheaply than by other reactor systems.

MONEY FOR REACTORS – The fiscal 1960 appropriations bill for the Atomic Energy Commission already passed by the House, provides for a cut of only $10 million in the $407 million request made by the administration. This minor cut coming out of the research phase leaves funds for new atomic power reactor projects. Actually the final bill includes an extra $3 million to begin work on a nuclear superheat reactor just in case developmental work progresses more rapidly than expected.

—EW—

The U. S. Court of Claims has ruled that the Dixon-Yates contract was valid and has directed the government to pay the Mississippi Valley Generating Co. $1,867,000 in termination costs. The Justice Department claimed that a conflict of interest on the part of A. H. Wenzell rendered the contract null and void. The Justice Department must decide now whether to go to the U. S. Supreme Court or —PAY.

—EW—

KINDERGARTEN ECONOMICS —Dr. Roscoe L. West, a distinguished educator, suggests that the economic facts of life can be taught to very young children. He says, "Economics is considered a difficult subject. Anatomy is also considered a difficult subject, but our schools still teach such related subjects as hygiene, sanitation and first aid. In both fields, the student should be given sufficient knowledge to take care of himself."

—EW—

The utility speech maker would do well to arm himself with the 1959 edition of "I Want to Know About the Electric Industry" which has just been published by the Edison Electrical Institute.

—EW—

CHOPPING BLOCK – The Federal Power Commission has made clear its conclusion that utility company ads seeking to educate the public on the public-private power controversy must be considered as below the line expenditures and as such must be paid for by shareholders rather than consumers. While there are still some arguments to be heard there is little hope for change short of going to the U. S. Supreme Court or to the Congress.

The best hope appears to lie in the fact that utilities are not alone in their concern over current tax treatment of political expenditures and may receive outside help. Another possibility would be to revise the tax treatment for public groups engaging in legislative activities.

The bald fact remains that the composition and temper of Congress is not favorable to any changes.

—EW—

A power integration contract between Idaho Power and three Bureau of Reclamation power projects — Palisades, Boise and Minidoka — has been approved, providing 30,000 kw additional firm power from the three bureau projects. The contract calls for mutual wheeling arrangements between Idaho Power and the bureau. To the extent that it is available the bureau will sell up to 19.5 million kwh annually to Idaho Power Co.

—EW—

WHICH CAPITALIST? — In December 1954, Rowland R. Hughes, then director of the Bureau of the Budget, said, "(The federal government) is, among other things, the largest electric power producer in the country, the largest insurer, the largest lender and the largest borrower, the largest landlord and the largest tenant, the largest holder of grazing land and the largest holder of timberland, the largest owner of grain, the largest warehouse operator, the largest shipowner, and the largest truck-fleet operator. For a country which is the citadel and the world's principal exponent of private enterprise and individual initiative, this is rather an amazing list."

—EW—

Recognizing that America's colleges and universities are the fountainhead of industrial progress, corporate gifts to colleges and universities have increased—from $40 million in 1953 to $136 million in 1958. The 1959 total is expected to reach $150 million.

—EW—

THE NATIVES ARE RESTLESS— Political observers are finding that the man on the street is resentful of the ever-increasing tax burden at the national, state and local levels.

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Engineers with an eye for good design know at a glance that Southern States fittings are top quality throughout. Made in our own plant from carefully chosen bronze or aluminum alloys, they provide maximum mechanical and electrical characteristics. Recessed boltheads permit one-wrench assembly. Never underestimate the importance of a good connection!

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increased taxes, even for schools, are being turned down by the voters.

The Los Angeles *Times* urged its readers to write their congressmen to protest against inflationary federal spending—and more than 30,000 did just that.

—EW—

PRICE HONORED—For the first time in its 58-year history, the John Fritz Medal award has been awarded to a nontechnical man, Gwilyn Price, chairman of the board of Westinghouse Electric Corp.

The award, which is the combined offering of four engineering founders societies, was given to Price for "his inspirational leadership, industrial pioneering and personal initiative in marshaling the creative forces of research and engineering to the cause of developing atomic power for national defense and for the human welfare."

—EW—

The best indication over the ultimate fate of the TVA bond financing bill came from President Eisenhower at a recent news conference. He said, "There are two serious defects," a statement interpreted in Washington to indicate that the legislation will be vetoed once it gets to his desk. He explained that the legislation has no provisions for budget bureau review and that there is failure to give a proper restriction on expansion.

—EW—

1965's PROBLEM—For the first time in eight years freshman enrollment in engineering is down 11%.

All this in the face of an over-all freshman enrollment increase of 7%. College deans point to (1) a false appraisal of engineering opportunities resulting from engineering layoffs during the 1957-58 recession, (2) increased concern over the rigors of the engineering curriculum, (3) competition from other scientific fields for potential engineering students.

—EW—

ALASKAN POWER POOL—An interagency group has issued a report through the office of civil and defense mobilization recommending the establishment of a power pool for the Anchorage-Fairbanks area.

The survey indicates the need of a 115-kv transmission line to (1) interconnect the Anchorage, Fairbanks and Big Delta areas; (2) provide an outlet for mine-mouth thermal energy in the Healy area; (3) connect with proposed hydro plants on the Susitna and Nanana Rivers; (4) supply power to isolated systems along its route; (5) supply construction power for new projects; (6) provide an outlet for experimental atomic plants; (7) supply backup power to the ballistic early warning systems.

—EW—

The controversial Trimble Bill aimed at reducing the percentage of construction costs allocated to power features in order to reduce federal power rates has run into trouble. The big problems: (1) most everyone agrees that Congress should retain jurisdiction over how costs are allocated, and (2) nearly every method for allocating costs would favor one area and hurt another.

—EW—

PRIMER—Speaking before the Rotary Club of New York City, Edwin Vennard, managing director of EEI, stated some facts for their serious consideration.

Federal government nondefense spending per family has increased from $86 in 1930, to $548 in 1959, or more than 500%. Federal government employees grew from 644,000 in 1930 to 2.1 million people today, an increase of over 200%. Taxes in 1930 took 13% of the national product, as compared with 29% in 1958.

The national debt has grown from $540 per family in 1930, to $5,500 per family in 1959, an increase of more than 900%.

—EW—

The Currecanti project on the Gunnison River received another boost as Interior Secretary Seaton reported to the Congress that the project was both engineeringly feasible and economically justified. The two dams under construction, Morrow Point and Blue Mesa, would cost $75 million, generate 100,000 kw.

—EW—

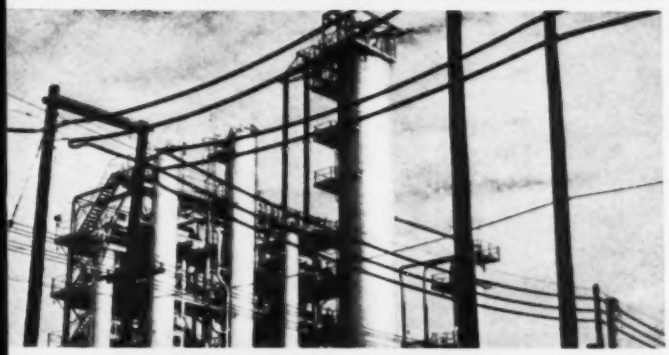
AUTUMN—Before ELECTRICAL WEST comes your way again, leaves will be falling, vacation bills will be coming in, school clothes and books will be purchased and you'll have to buy antifreeze. Have fun with the budget.

How Okonite solves your High-Voltage Distribution Problem

Reliable primary distribution is a must for efficient, economical operation. As the use of higher voltages increases, the problems of keeping primary distribution reliable increase too. But, whatever your specific need, Okonite has designed a construction that will do the job . . . like those shown here.

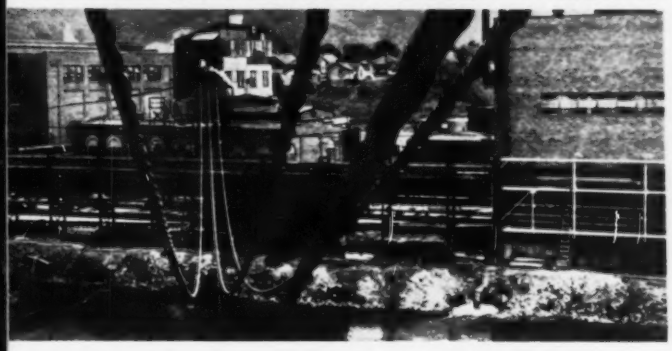
OKOLITE-INSULATED

This Okolite-insulated 25kv submarine power cable, installed by Bonneville Power Administration under Puget Sound, was 7½ miles long, weighed ¾ million lbs. It is typical of the many Okolite-insulated cables designed to solve specific high voltage power problems. Other constructions for underground, aerial, duct or interior installation are frequently protected by an Okoprene (neoprene) sheath, compounded to Okonite's own formula for high weather, temperature and abrasion resistance. Okolite oil-base insulation has demonstrated in more than 30 years of service its high dielectric strength, moisture-resistance and stability in all types of installation conditions. All Okolite-insulated cables must withstand self-imposed a-c and d-c voltage tests that are highest in the industry.



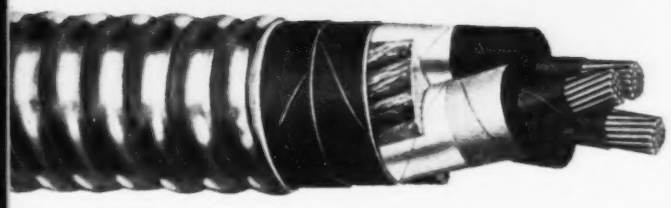
OKONEX-OKOPRENE

This Okonex-Okoprene 15kv primary distribution system was installed to save space, eliminate safety problems and provide improved voltage regulation at Magnolia Petroleum's 1500-acre refinery near Beaumont, Texas. Okonex (butyl-base) cables are highly resistant to heat, and are often specified to give additional protection in high ambient parts of the plant or to provide additional ampacity in circuits. The Okoprene sheath provides excellent protection against moisture and corrosion as in Magnolia Petroleum's refinery where there was a high moisture-saline content in the air plus chemical atmospheres at many of the processing units.



SELF-SUPPORTING CABLE

These four 7500-volt Okolite-Okoprene self-supporting aerial cables span 395 feet to distribute power to a section of a Southern paper mill. Easy to install in one simple operation, Okolite-Okoprene self-supporting aerial cable reduces clearance space requirements, is neat-appearing, often may be installed on existing buildings or supports, offers greater safety to personnel and eliminates insulator flashover due to contamination. Okonite's patented Dualay assembly can be tapped hot at any point in non-shielded types.



LOXARMOR

And on any high-voltage construction, a Loxarmor covering offers economy and flexibility in a cable system where the complete protection of a rigid conduit system is not required. Excellent mechanical protection is provided by a Loxarmor interlocking "S" tape available in galvanized steel, aluminum, bronze or copper. Loxarmor saves money in installation and initial purchase costs, makes it easy to add or re-route circuits and requires less space than conduit to handle the same number of circuits.

One of these high-voltage cable constructions will fill your requirements. Write for Bulletin WE-1117, "How to Choose Insulated Cable," to The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, New Jersey.

***where there's electrical power... there's* OKONITE CABLE**

7090

YOU, TOO, ARE A MAN

WHO HAS TO KNOW . . .

EXTRA PROFIT is the result of your investment in General Electric voltage regulators

Dividends from General Electric voltage regulators pay off in Extra Profit for you.

In addition to superior product design and workmanship, examine the benefits of Research, Service and Product Dependability that are available with your investment in General Electric regulators. No other manufacturer can match these dividends.

REGULATOR RESEARCH from General Electric has provided industry leadership in regulator development, and will continue to provide even more efficient and economical system regulation in the future.

REGULATOR SERVICE means experienced G-E application engineers, prompt delivery from local warehouses, expert installation and operation assistance, and an unequalled network of complete maintenance and repair facilities at local Service Shops.

REGULATOR DEPENDABILITY gives you absolute minimum maintenance which means less attention during equipment life, and greater operating economy. This is one reason why more General Electric regulators are in use today than any other make.

The effects of a regulator purchasing decision will be felt for many years by operating personnel, responsible for equipment maintenance, and by utility management, responsible for profit. The next time you review your regulator requirements, consider the important dividends which *only* G.E. offers . . . and specify General Electric voltage regulators. General Electric Co., Schenectady 5, New York. 423-38

Progress Is Our Most Important Product

GENERAL ELECTRIC

J. Coleman Jones, General Superintendent, tells why . . .

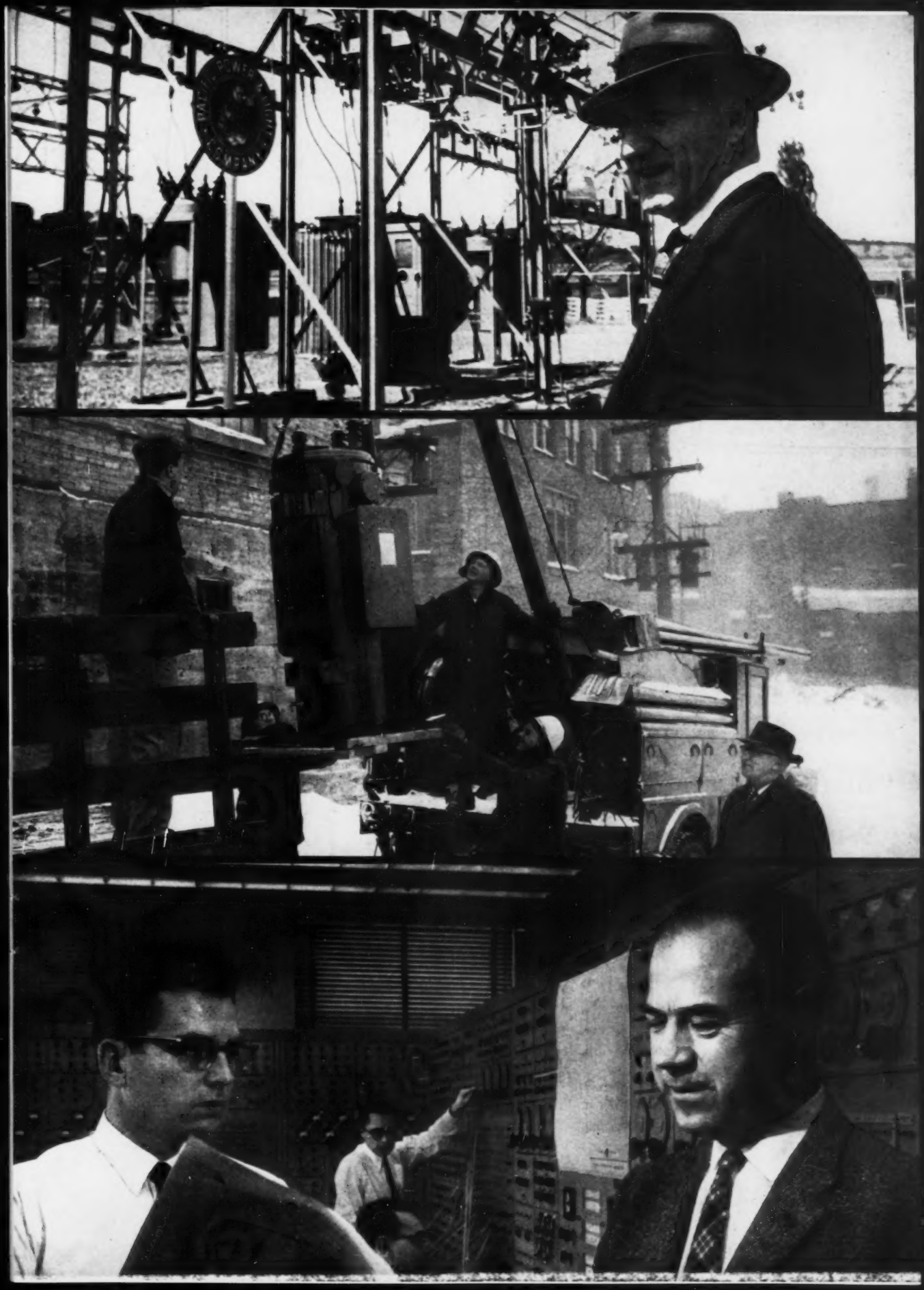
DEPENDABILITY paid a dividend for Pacific Power & Light's investment in General Electric voltage regulators. Dependable performance of G-E MLT-32 three-phase step voltage regulators holds maintenance time and cost down, provides reliable substation regulation.

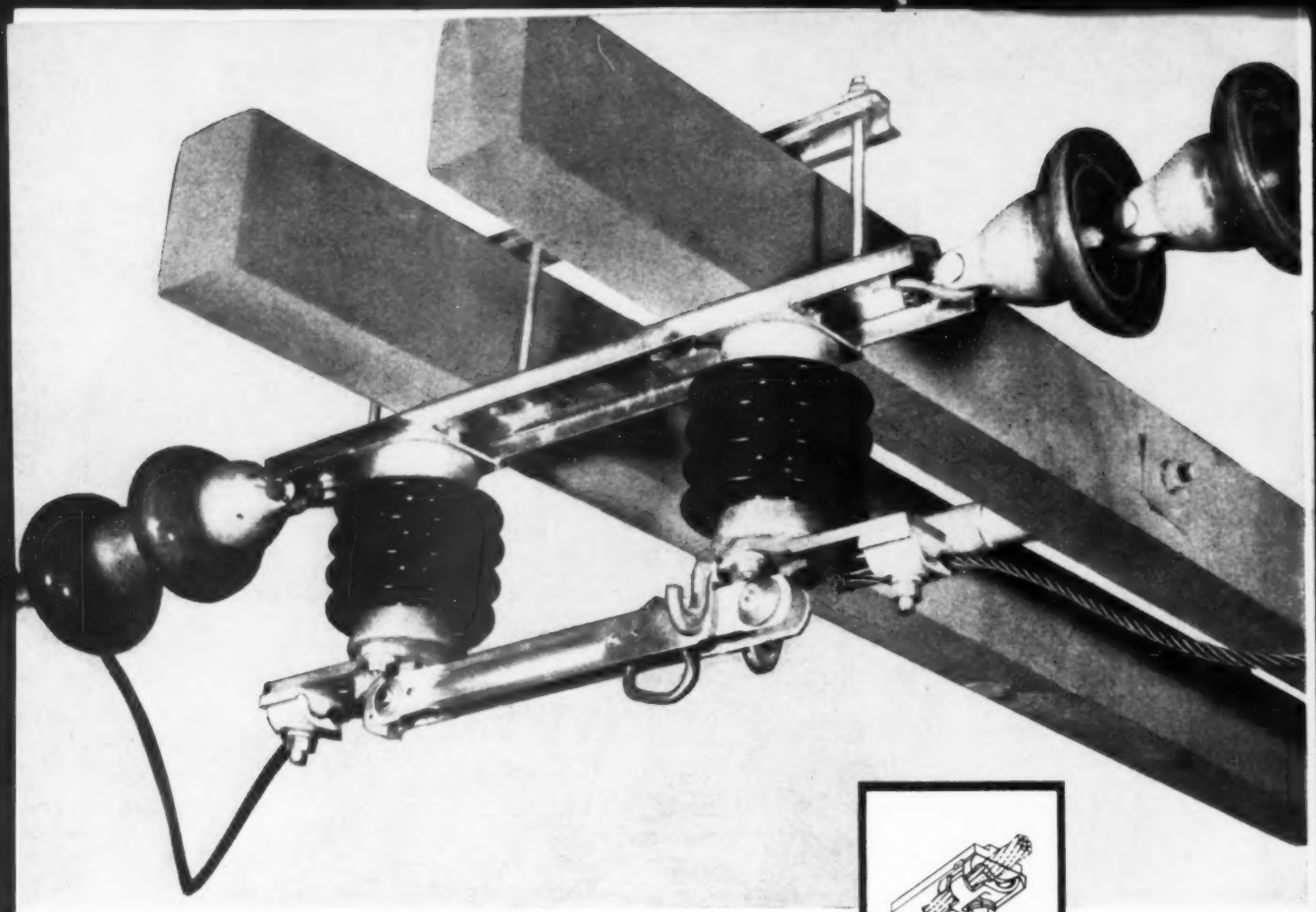
W. E. Dugdale, Purchasing Agent, tells why . . .

SERVICE paid a dividend for Upper Peninsula Power's investment in General Electric voltage regulators. Overnight regulator delivery cut outage time to an absolute minimum.

George K. Kallenbach, Operating Superintendent, tells why

RESEARCH paid a dividend for Niagara Mohawk's investment in General Electric voltage regulators. G-E system research used network analyzers to determine the optimum regulator arrangement to solve a unique problem.





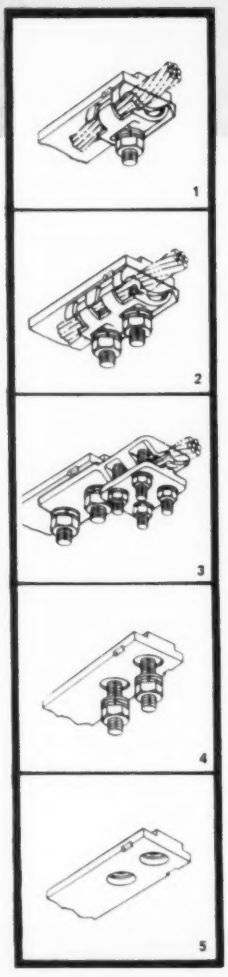
S&C LOADBUSTER DISCONNECT rated 400 amps continuous, 15 kv, 95 kv BIL. For use with LOADBUSTER® S&C's portable loadbreak tool

Now with S&C LOADBUSTER DISCONNECTS you have widest choice of connectors

No matter what your connector preference, you can satisfy it with S&C's LOADBUSTER DISCONNECTS. Here's why: You can get a choice of two new styles of groove-type connectors (details at right) and three NEMA Standard pad terminal connectors. Not enough?

You can also have the LOADBUSTER DISCONNECT with aluminum or bronze captive bolts—an S&C first—for hot-line tool installation of compression connectors. Or, if you prefer, you can obtain this disconnect without any connectors or connector hardware.

For more details please write for Bulletin 721. S&C Electric Company, 4425 Ravenswood Ave., Chicago 40, Ill.



1. NEW Bronze groove-type connector. Single bolt, captive for hot-line tool handling. Takes No. 2 solid through 500 Mcm stranded copper.

2. NEW Aluminum alloy groove-type connector. Zinc-tin plated, two bolt, captive for hot-line tool handling. Takes No. 2 solid copper through 500 Mcm stranded copper or aluminum.

3. NEMA standard pad terminal connectors for copper conductor. Three sizes: No. 6 solid through 2/0 stranded; 2/0 solid through 4/0 stranded; and 250 Mcm through 500 Mcm.

4. NEW Aluminum or bronze captive bolts. Will take your choice of connectors—compression or other types.

5. NEW. Any connector can be used with this terminal pad. It has standard NEMA drilling—two 9/16" holes on 1¾" centers.

S&C ELECTRIC COMPANY

PRODUCT NEWS

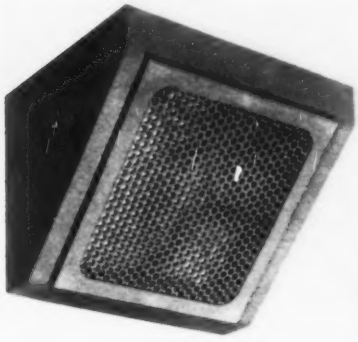
New Designs and Applications

Post Lantern Control

(1) *Progress Mfg. Co. Inc., Castor Ave. & Tulip St., Philadelphia 34, Pa.*

Post lanterns for outdoor lighting available from this company can be equipped with a photoelectric cell and provide automatic on-off operation. The control is made to fit any 3-in. post and will hold all standard post lanterns. Shipped prewired for easy installation.

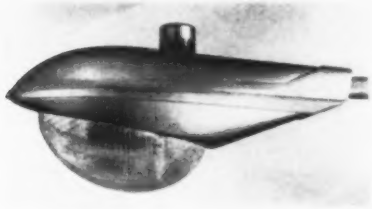
San Francisco's Giants will play night baseball under lighting equal to the brightness of 400 million candles at their new Candlestick Park. Westinghouse Electric officials have announced that 1,147 special floodlight fixtures will be mounted on towers with each tower carrying from 100 to 200 floodlights. Walter J. Maytham, Pacific Coast vice-president of Westinghouse, said, "The lights, precisely aimed, are designed to burn overvoltage, increasing their normal candlepower 30%. The units will make Candlestick Park one of the nation's best lighted baseball parks"



Security Lighting

(2) *McPhilben Lighting Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y.*

This new unit is designed to meet exceptionally rigid requirements for maximum security areas such as prison cells, psychopathic wards, detention buildings, etc. It features one-piece cast aluminum housing of heat-treated high tensile strength alloy, rugged nonremovable 10-gage perforated steel protective guard with 48% open area over a ¼-in. clear Herculite glass plate and high-stress Holophane Controlens. It fits between wall and ceiling. Optional front or back access.



Mercury Luminaire

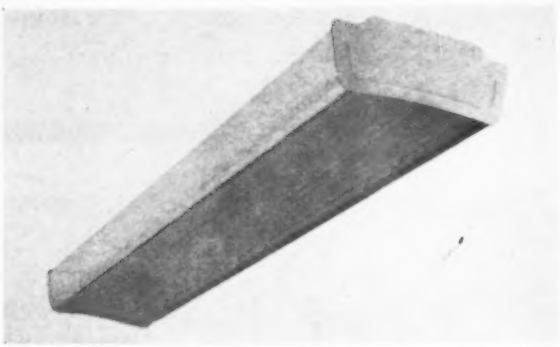
(3) *General Electric Co., Schenectady 5, N. Y.*

An all-new line of mercury vapor street and highway luminaires and a new photoelectric control have been announced by this company. Featured are sleek modern appearance, easier installation and maintenance and higher lighting efficiency, according to the company. Locking-type receptacles for integral mounting to the new cadmium-sulphide control are available on all units. Power Pack built-in ballasts are standard equipment, although all three units are available without them.

Decorative Fixtures

(4) *Jay Lighting Mfg. Co. Inc., 7 E. 35th St., New York, N. Y.*

The alternating stripe motif of the parasol has been used to create a polished brass lighting fixture line by this manufacturer. There are white and gold pull-downs and chandeliers, ceiling fixtures and wall brackets.



Plastic Dualens Shield

(5) *Garden City Plating & Mfg. Co., 1750 N. Ashland Ave., Chicago, Ill.*

This new lighting fixture has a two-tone plastic Dualens shield. It has sides in diffuse white and a patterned crystal clear bottom. Purpose is to cut down side brightness while allowing efficient down lighting. The shield may be lowered from either side and hangs on a continuous hinge. Can be installed in continuous run or individually. Available in one-, two- and four-lamp models.

Prismatic Plastic Luminaires

(6) *Keystone Electric Mfg. Co., 2228 E. Tioga St., Philadelphia 34, Pa.*

Options of either three or two lamps and of 4-ft rapid start or slimline, 8-ft slimline, color-stabilized polystyrene or acrylic plastic diffusers are available in this fixture. Cross-sectional dimensions of the unit do not have to be altered to incorporate this versatility.

Fluorescent Fixtures

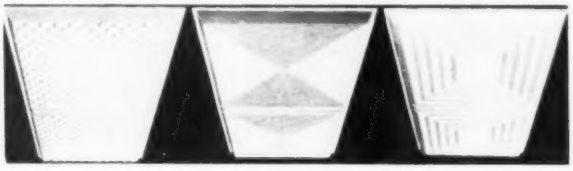
(7) *Day-Brite Lighting Inc., 6260 N. Broadway, St. Louis 15, Mo.*

Available in both 4- and 8-ft models for rapid start and slimline lamps, this new fixture has a clear, low brightness prismatic enclosure with translucent side diffusers to permit uplighting. It is guaranteed five years against discoloration. Can be mounted on the surface or by suspension.

Balanced Light Control

(8) *Superior Electric Co., Bristol, Conn.*

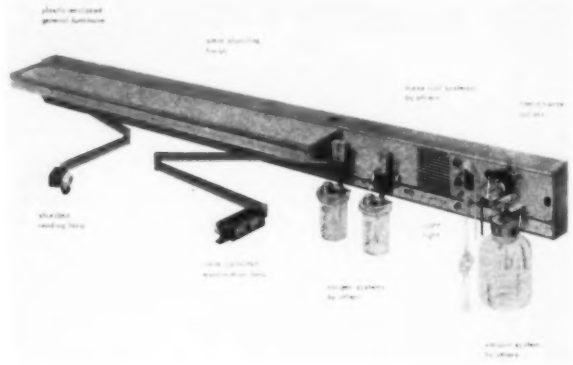
A new light control system offered by this company is said to "measure" daylight and balance it with electric light to assure a constant level of room illumination. Nerve center of the system is the "Lumistat," a dial that presets the desired amount of room light. A photoelectric scanner is mounted where it can best monitor the lighted area to measure the amount of combined daylight and artificial light in the room. This information is relayed to a signal station that compares the reading to the Lumistat setting. If the readings differ, signals are sent to the Luxtrol automatic light controller, which dims or brightens the lights to maintain the desired level.



Diffuser Panel Line

(9) *Lightonics, Box 7211, Oakland 1, Calif.*

This company announces a new line of diffuser designs measuring 2x4 ft that matches the standard 2x2-ft diffusers. They are available in both single and double dirt-shield panels. Double panels consist of two plastic sheets placed apart and fastened around the perimeter with white or bright metal edges.



Hospital Unit

(10) *Sunbeam Lighting Co., 777 E. 14th Place, Los Angeles 21, Calif.*

This company is offering a new compact, multifunction hospital patient service unit. It is a single, integrated hospital bedroom console type service unit incorporating at least 10 different services normally installed separately. Contained in the package are a general illumination unit, shielded reading light, color-corrected examination light, night lights, convenience outlets, provision for a nurse-call system and oxygen and vacuum systems. Also contained are television lead-ins, phone outlets and an accessory intravenous apparatus support arm. It provides for feed-through of all plumbing and electrical services for four beds into two rooms.

lowest thinnest trimmest

of all electric baseboard heat!

Arvin

Invisa-Line

with exclusive safety limit thermostats

Here is the most advanced, most thoughtfully engineered and the most wanted of all electric baseboard heat. Thinner, lower, trimmer styling . . . lower, completely safe surface temperature . . . heavy, rod type heating elements for maximum efficiency and long life . . . new, easier methods of installation are all powerful selling features of Arvin Invisa-Line.

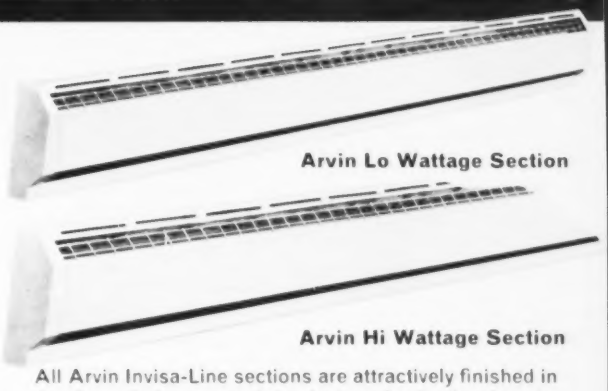
Arvin Lo Wattage units are a scant four-and-one-half inches high—a sleek one-and-three-quarters inches thin. Hi Wattage units are scarcely six inches high and two inches thin. Both hug the wall and disappear from conscious view once installed!

Arvin Invisa-Line comes in convenient-to-install pre-wired sections that are easily joined at either end to provide the exact amount of heat needed. Each section, depending on length, contains one or more safety limit thermostats—another Arvin *exclusive* that makes the safest heat even safer.

Take full advantage of the profit potential presented by the strong trend toward electric heat. Offer your customers wonderful new Arvin Invisa-Line Baseboard Heat. It is destined to dominate the field!

In Arvin Invisa-Line, the rod type heating unit is welded to continuous radiating fins and units are mounted on full-floating holders to allow expansion and contraction without popping or cracking. Units are fully guaranteed for five years.

Small, compact, convenient thermostat baseboard sections are available for more economical installations of heat control. These save "wiring in" wall thermostats, a feature your customers will appreciate. Wall thermostats can be used if desired, however.



Arvin Lo Wattage Section

Arvin Hi Wattage Section

All Arvin Invisa-Line sections are attractively finished in the finest beige enamel, backed on for lasting beauty.

Sections can be painted to match walls or baseboards. Note handsome chrome plated top grille that prevents objects from falling into units and aids in directing warm air flow into room.

Arvin

Consumer Products Division

ARVIN INDUSTRIES, INC.

COLUMBUS, INDIANA

Sell a new world of warmth...

Arvin

RADIANT AND FAN FORCED ELECTRIC WALL HEATERS

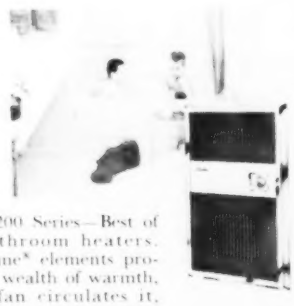
Your customers will welcome the warm comfort, appreciate the handsome styling and be glad they chose an Arvin no matter which of these fine electric heaters they decide to buy.

And buy they will because of the decided overall superiority of the Arvin line. Instant heat, complete safety, ease of installation, attractive prices are all customer-convincing Arvin advantages that give you a big edge over competition.

Arvin's 27 years of experience and world leadership in portable electric heat is so readily apparent in the entire line that even a casual comparison with others emphasizes the business wisdom of selecting Arvin.

Saleswise, profitwise, the Arvin line will work best for you!

Arvin 100 Series—Instant heat, high styling, complete safety win sales for these sleek, slim-lined radiant bathroom heaters. They're wanted on sight!



Arvin 200 Series—Best of all bathroom heaters. Nichrome* elements produce a wealth of warmth, quiet fan circulates it, thermostat maintains temperature.

Arvin 400 Series-Heavy-duty, for home or office use. Push button controls, Safety Limit Thermostat and warmth-casting reflectors are buy appeals in all models.

Arvin 300 Series—In Summer the husky fan cools, in Winter it provides extra penetration of warmth. Push button controls in all five models.

Arvin also manufactures a complete line of Ceiling Cable with deluxe and standard wall thermostats in both single and double pole.

Arvin

ARVIN INDUSTRIES, INC.
Consumer Products Division
COLUMBUS, INDIANA

Light Dimmer

(11) *Moe Light Division, Thomas Industries Inc., Fort Atkinson, Wis.*

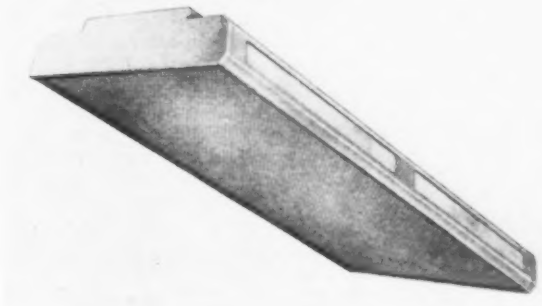
A variable autotransformer controlling the amount of power is used in this new light-dimming device. Special 26-gage transformer "C" grade electrical steel laminations made by Allegheny Ludlum Steel Corp. are said to help make the dimmer work better and safer. The unit has a built-in automatic reset circuit breaker that eliminates fuses, plus a built-in line switch that prevents the transformer being energized when the lights are not on.

Photoelectric Control

(12) *Fisher-Pierce Co., South Braintree 85, Mass.*

A special photoelectric lighting control offered by this company is designed to fit mounting bases up to 3⅝ in. in diameter, such as ornamental pole tops and certain luminaires. A complete line of adapters, mounting brackets and mounting taps is available.

Fill in Coupon . . . . p 25



Extra-wide Fixture

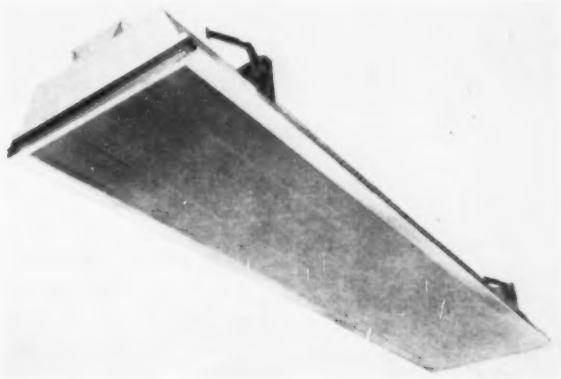
(13) *Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo.*

Designed for application in stores and offices, these new fixtures are 2 ft wide and are available with either plastic side windows or solid steel sides. They are furnished in four- and six-light units with either Gratelite louver diffuser bottoms or a reversible prismatic louver-lens. Companion units are available in 12- and 17-in. widths.

Commercial Luminaires

(14) *Curtis-AllBrite Lighting Inc., Curtis Lighting Division, 6135 W. 65th St., Chicago 38, Ill.*

A new group of contemporary styled fluorescent commercial luminaires is announced by this company. First in the series are luminaires featuring a functional crystal plastic prismatic refractor. The Visitron (illustrated) is another that has a one-piece white plastic diffuser. Both luminaires feature shallowness and balanced proportions. Available for two or four 40-w rapid start fluorescent lamps.



Shallow Troffers

(15) *Smithcraft Lighting, Chelsea 50, Mass.*

A new series of 1- and 2-ft-wide troffers is offered by this company. The units recess only 4 15/16 in. and are available in four basic types. A feature is a telescopic door frame that automatically adjusts to fit even irregular ceiling openings. Other features include a wiring access door, large end openings for continuous wiring and mounting brackets with no loose parts. Available with a wide variety of shielding media.

(For more information about the products on these pages, fill in the coupon on p 25.)

"HE'S BEEN UP THERE FOR 15 YEARS

. . . TO GET A BETTER SLANT ON THINGS"

The person who designs a streetlight control without ever having climbed a pole is like a boat builder who has always lived in Iowa — he just can't appreciate the user's point of view. And to a lineman installing a photoelectric control, the right "point of view" is a matter of his safety, how long he has to spend up there and how easily he can get the control in service.

In the design and construction of the 6600A Series controls, we've tried to make the lineman's job just as safe and easy as possible. The 6600A is small and light enough to be carried in one hand, and the case indentations give a gloved hand a better grip. We could have painted it sky-blue pink, but plain gray attracts fewer rocks and BB guns. The whole "package" is rugged (even though you ought not to expect it to work if it's bounced on the pavement from 30 feet up); the bracket can be used in a pinch as a footh-old, yet it doesn't clutter up the pole.

Color-coded lead wires from the adapter socket have good strain relief — and connection instructions are on the nameplate. If you want to use your own wiring, the twistlock socket comes with terminal screws that will take stranded wire up to #10.

Since a 6600A should be oriented to face between NW and NE, the design allows full 360° rotation. This directional characteristic and a half-second time delay also simplifies testing — with his gloves *on*, the lineman can check out the installation in nothing flat.

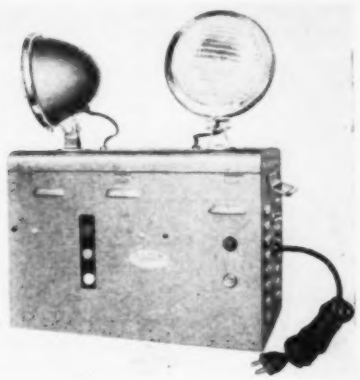
Certainly each of these items is a small thing in itself. But taken together, they add up to a practical control that minimizes risk and problems for the lineman. They are not the result of genius on our part, but simply 15 years of observation and experience. The Fisher-Pierce Co., 43 Pearl St., So. Braintree 85, Mass.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

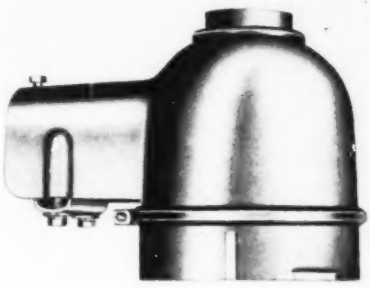
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.



Emergency Light

(16) *U-C-Lite Mfg. Co., 1050 W. Hubbard St., Chicago 22, Ill.*

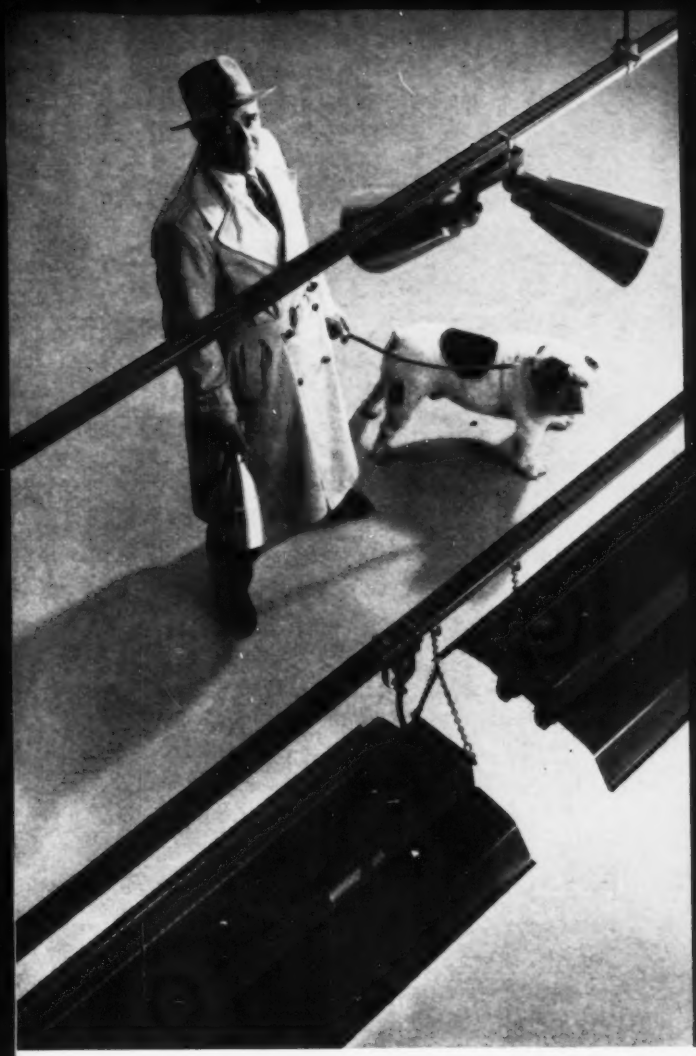
A new automatic emergency auxiliary light for various commercial establishments is offered by this manufacturer. It has a fully automatic charge system that maintains a correct rate of charge at all times. It turns on instantly in case of failure of the regular 110-115-v a-c lighting circuit. When the circuit is restored to normal, the unit then turns off and the automatic charge system begins to restore the glass jar battery to full capacity. Equipped with two 6-in. adjustable sealed beam lamp heads.

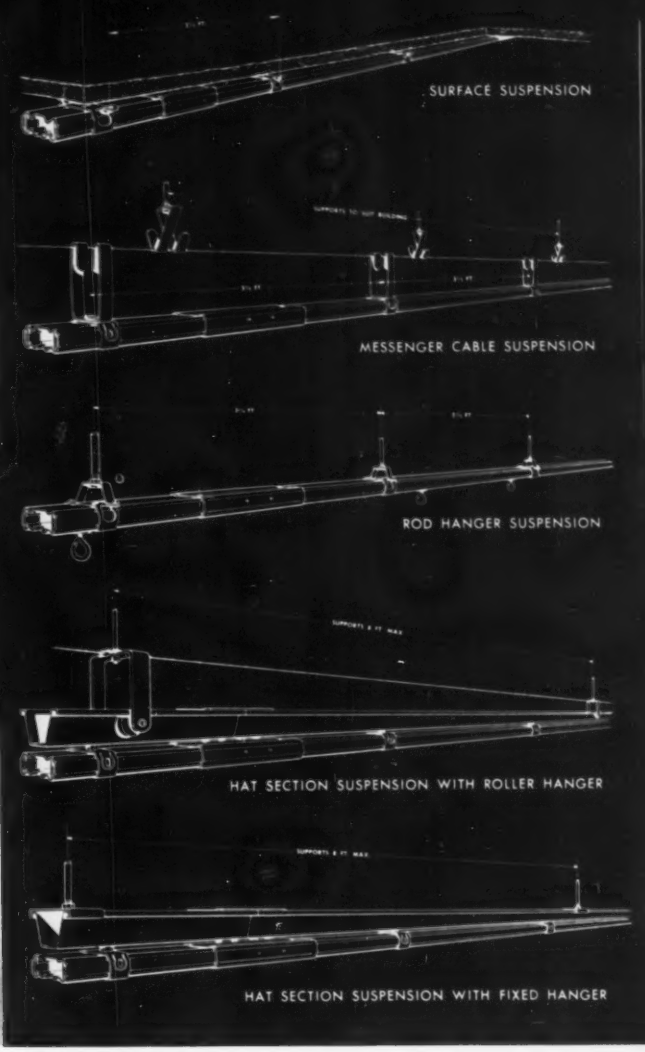


Rotatable Luminaires

(17) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

Rotatable metal heads are available from this company. They are designed to permit 360° orientation of an assembly. Features include standard bail latch mounting ears, a clamping band that facilitates rotation of the assembly and a slip fitter for mounting on 1¼-in. pipe. Constructed of aluminum. It is available with or without a photoelectric control adapter.




SURFACE SUSPENSION
MESSENGER CABLE SUSPENSION
ROD HANGER SUSPENSION
HAT SECTION SUSPENSION WITH ROLLER HANGER
HAT SECTION SUSPENSION WITH FIXED HANGER

TAKE YOUR CHOICE...
UNIVERSAL LIGHTING DUCT OFFERS 5 METHODS OF SUSPENSION!

You can solve virtually any lighting fixture placement problem with Bull-Dog Universal Lighting Duct. The prefabricated, standardized duct is amazingly easy to assemble and you have your choice of *five different suspension methods* for either the 20-amp or 50-amp ratings. One or a combination of these methods will adapt to any structure . . . and meet any installation requirement quickly and economically.

"ULD" is a continuous electrical outlet, with conductors running the entire length of the duct. Duct sections telescope together mechanically and electrically by a plain coupling. Light fixtures connect quickly by means of twist-out plugs which can be added or repositioned at any point. Plugs are available for direct fixture attachment or will take a standard attachment cap. The duct both feeds and supports fixtures . . . can be easily disassembled and relocated as lighting needs change.

You'll find Universal Lighting Duct is less costly than installed pipe and wire. And if the lighting plan is altered during construction, "ULD" can be repositioned without time-wasting "rewiring."

On your next wiring job look into the economies of Universal Lighting Duct. You'll find it is the most efficient, economical and flexible lighting duct system available. "ULD" is U/L listed.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Consult the following Pacific Coast representatives:

Coast Electric & Manufacturing Co.
1733 N. E. Seventh Ave., P. O. Box 7712
Portland 12, Oregon

Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

Safety Switchboard Company
910-89th Avenue
Oakland 21, California

Bulldog Elec. Prod. Co. of Los Angeles
2885 E. Washington Blvd.
Los Angeles 23, California

NEW One-Shot

Hydraulic Knockout

Punch Drivers

punch holes for ½"–4" conduit

no pre-drilling or step-up punching

Save many dollars on conduit installations with the new GREENLEE One-Shot Knockout Punch Driver. Lightweight, easy to carry, powerful! Fast one-man setup and operation. Deep 8" throat lets you position punch exactly where needed. High-strength aluminum "C" frame provides ample rigidity for slicing through 10-gauge steel with a few strokes of the hydraulic pump. No waste motions . . . fast, accurate work . . . better profits per job!

two sizes

No. 1732 (above) fits all GREENLEE Knockout Punches and Dies ½" - 4". Weighs only 35 lb.

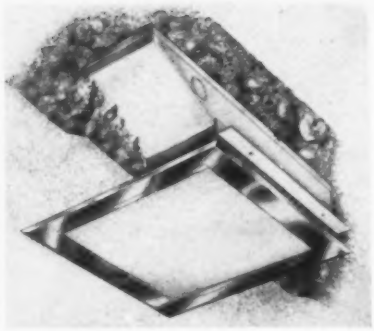
No. 1731 (right) fits GREENLEE Knockout Punches ½", ¾", and 1" with special dies. Weighs only 15 lb.

Both models are used with GREENLEE hand- or power-operated hydraulic pumps. Ask your distributor for a demonstration, or write for descriptive bulletin E-292.

A COMPLETE LINE OF KNOCKOUT TOOLS HAND-OR HYDRAULIC-PUMP OPERATED

GREENLEE TOOL CO.
1763 Columbia Avenue
Rockford, Illinois

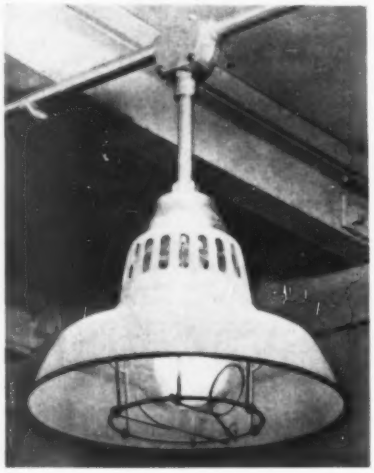
GREENLEE



Fixture for Concrete

(18) *Prescolite Mfg. Co.*, 2229 *4th St., Berkeley, Calif.*

Availability of a new series of shallow, recessed lighting fixtures for use in concrete pour construction is announced by this company. The units are completely factory assembled and come equipped with a prewired compartment integral with the housing. Wiring within the units may be accomplished before or after pouring. The units are available with a variety of round and square glass and lens.



Industrial Fixtures

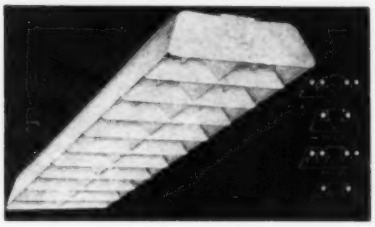
(19) *Crouse-Hinds Co., Syracuse 1, N. Y.*

New slotted reflectors are now available for both explosionproof and vaportight Condulet lighting fixtures. Uplight of slotted reflectors eliminates darkness above them and fixture operating temperatures are lowered. Circulation of air through the reflector reduces accumulation of dirt and dust and simplifies maintenance, according to the company.

Wall Fixtures

(20) *Markstone Mfg. Co.*, 1531 *N. Kingsbury, Chicago 22, Ill.*

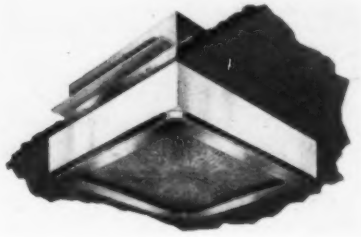
Designed for general illumination of rooms without top lighting facilities, this company is introducing a new series of incandescent wall fixtures featuring "open top" illumination. Glass with a beaded pattern provides diffused front lighting. Available with convenience outlets and optional switches, the fixtures come in 14-, 24- and 31-in. lengths.



Classroom Fixture

(21) *Benjamin Electric Co., Dept. E-5, Des Plaines, Ill.*

This company offers a new line of commercial fluorescent units designed primarily to meet lighting requirements for modern classrooms. Said to provide greater diffusion and better lamp shielding while remaining within the cost limitations for economy classroom fixtures. It is available for either surface or suspension mounting in either two- or four-lamp arrangement.



Semirecessed Fixture

(22) *Edwin F. Guth Co.*, 2615 *Washington Blvd., St. Louis 3, Mo.*

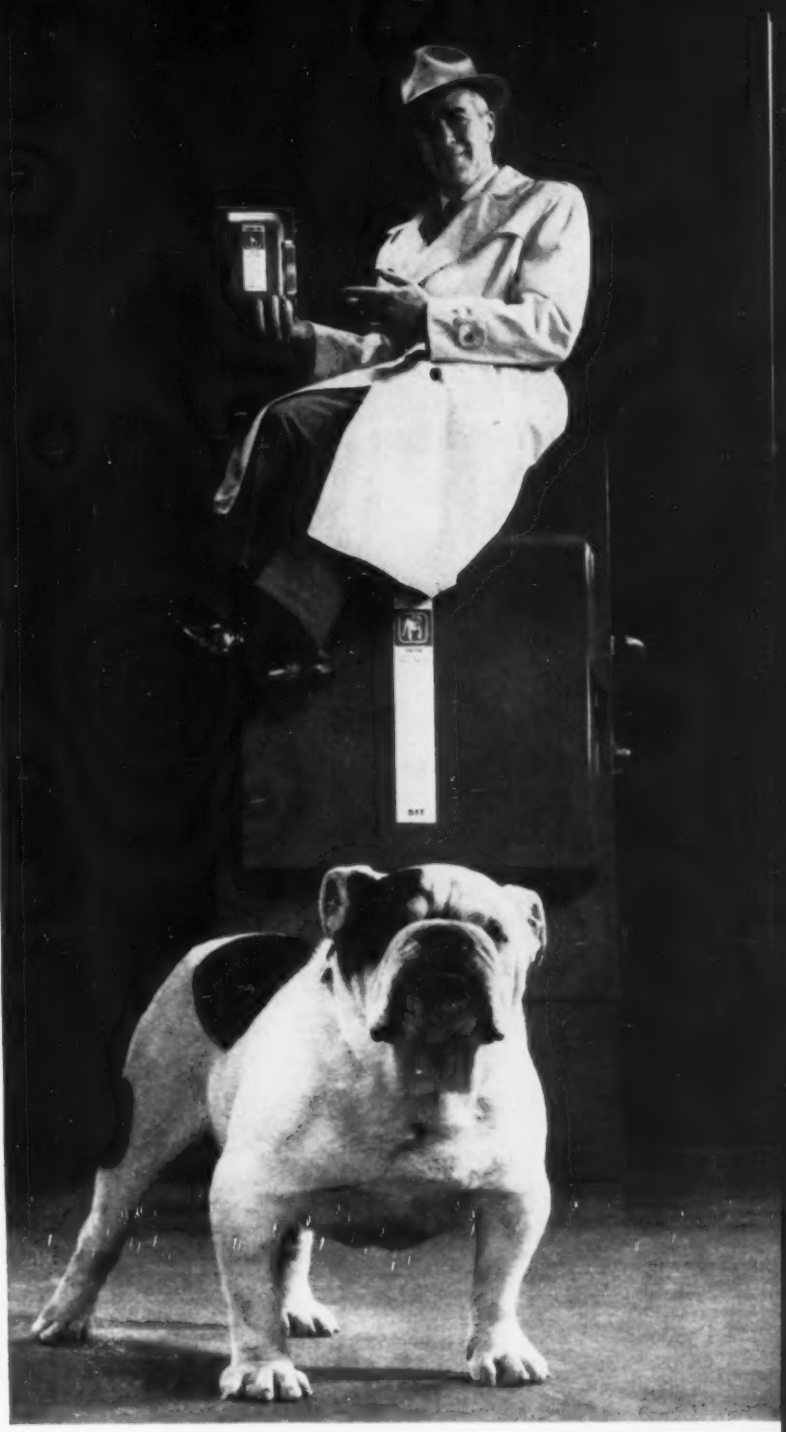
These new semirecessed fixtures are designed for use with shallow plenum ceilings. They require 3 to 4 in. recessing depths, depending upon the specific unit selected. They are available in more than 25 models in a wide range of sizes and lens bottoms.

Safest switches known

—in every size from 30 to 1200 amps

Large or small, BullDog Clampmatic® Vacu-Break® Safety Switches provide *maximum* protection . . . meet most every switching need. They provide added safety because of these two exclusives: The unique Clampmatic spring increases the pressure against contact jaws . . . assures clamp-tight connections . . . faster break . . . *really safe operation*. Vacu-Break action snuffs arcs immediately . . . reduces pitting and burning of contacts for long, trouble-free switch life.

BullDog's "Big Three" safety switches, the "Master", "Junior" and "Rain-tight", assure positive switching . . . virtually eliminate costly maintenance. Give your customer this extra safety, extra performance now with BullDog Vacu-Break Safety Switches.



For safety's sake buy Vacu-Break

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
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910-89th Avenue
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Los Angeles 23, California

Planning sample meter testing?

The success of your sample testing of tomorrow depends on the meters you buy today

Simplification of testing procedures can save your company up to 50% in meter testing costs. But the success of sample testing depends on the overall accuracy of the meters on your lines. 5 and 10 amp meters put a definite roadblock in the path of random sample testing by requiring tests up to ten times as often as modern meters. The meters you buy today can directly affect your sample testing of tomorrow.

Utility commissions are much more likely to approve the use of cost-saving testing methods if the meters on your system have sustained accuracy.

Sangamo J2 Meters provide such sustained accuracy with the highest torque and the slowest disk speed of any singlephase watthour meter. The Class 200 J2 Meter is adequate for *all* services . . . is accurate at 1½ amps . . . with ample capacity for the loads of the future. An analysis of the advantages of the J2 Meter is detailed in the "Meterman's Check List." Write for your copy today.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM59-9

For phone number of closest representative see advertising index in back of book.

BULLETINS ETC.

(23) FLUORESCENT SPECIFICATIONS—Proposed American Standard Specifications for the Chromaticity of Fluorescent Lamps, C78.376, has been published by the American Standards Assn., 70 E. 45th St., New York 17, N. Y. It deals with a proposed standard developed to establish color values and tolerances for the 40-w, T-12 fluorescent lamp to assure uniform color appearance. Cost is 60¢ a copy. Specifications are based on work of the Lamp Testing Engineers Conference, developed as a result of measurements made by the National Bureau of Standards.

(24) STREET LIGHT CONTROL—Bulletins GEA-6987, published by General Electric Co., Schenectady 5, N. Y., describes new cadmium-sulphide photoelectric control for dusk-to-dawn operation of street and highway lighting circuits. The units contain a new sensing element instead of vacuum tubes for longer life and dependability. Mounting and operating data for mercury, filament and fluorescent luminaires given.

(25) MERCURY LUMINAIRES—Bulletin GEA-6943, 12 pages, describes General Electric's new line of mercury luminaires for roadway lighting. Application data for various types of roadway lighting are given with diagrams, photos and photometric data. Guide form specifications and ordering information are also included. Write to the company at Schenectady 5, N. Y.

(26) NEW LAMP—Lamp Letter No. 59-86, published by General Electric's Large Lamp Department, gives information on the F40 lamp for universal use in preheat or rapid-start fixtures. The new lamp will replace the preheat F40T12 and the rapid start F40T12/RS. Light output is said to be nearly 6% greater. Write to the company at Schenectady 5, N. Y.

(27) FIXTURE CATALOG—Catalog 650, offered by Thomas Industries Inc., 410 S. Third St., Louisville 2, Ky., introduces the new Star Light line of lighting fixtures. The catalog contains 83 full-color illustrations, 30 individual lighting application drawings and 16 lighting ideas.

(28) FLOODLIGHTS—Bulletin 2714, available from Crouse-Hinds Co., Syracuse 1, N. Y., is a miniature edition of the company's floodlight catalog. Material included is how to select floodlights, general purpose floodlights, heavy duty, mercury vapor, special floodlights, lighting for hazardous locations, searchlights, underwater lighting, floodlight poles, accessories.

(29) FLUORESCENT FLOODLIGHTS—Bulletin GEC-1487B describes General Electric's line of Fluoroflood fluorescent floodlights for billboards, loading areas, highway guide signs, service areas, building fronts and minor sports areas. New rotating junction box that allows 360° aiming is diagrammed and calculated light distribution and photometric data listed. Suggested mountings and ordering information also given. Write to General Electric Co., Schenectady 5, N. Y.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after November 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

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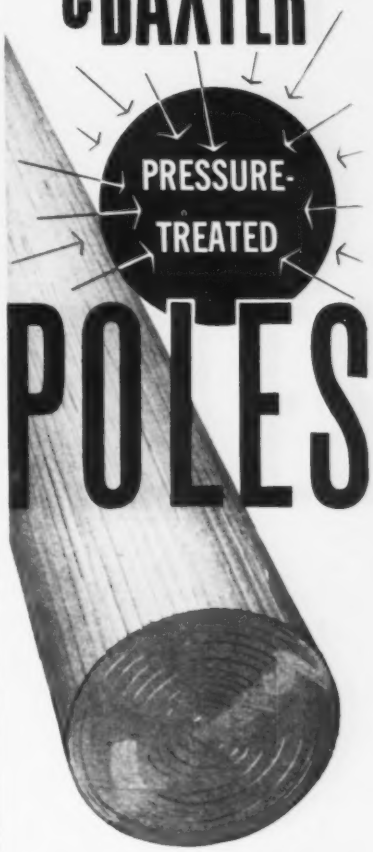
*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

McCORMICK & BAXTER



Years of extra service are processed into our straight, strong Douglas Fir poles. Machine-peeled, incised and full length pressure-treated with either Penta or Creosote. Available from stock in Portland, Oregon, and Stockton, California.

McCORMICK & BAXTER
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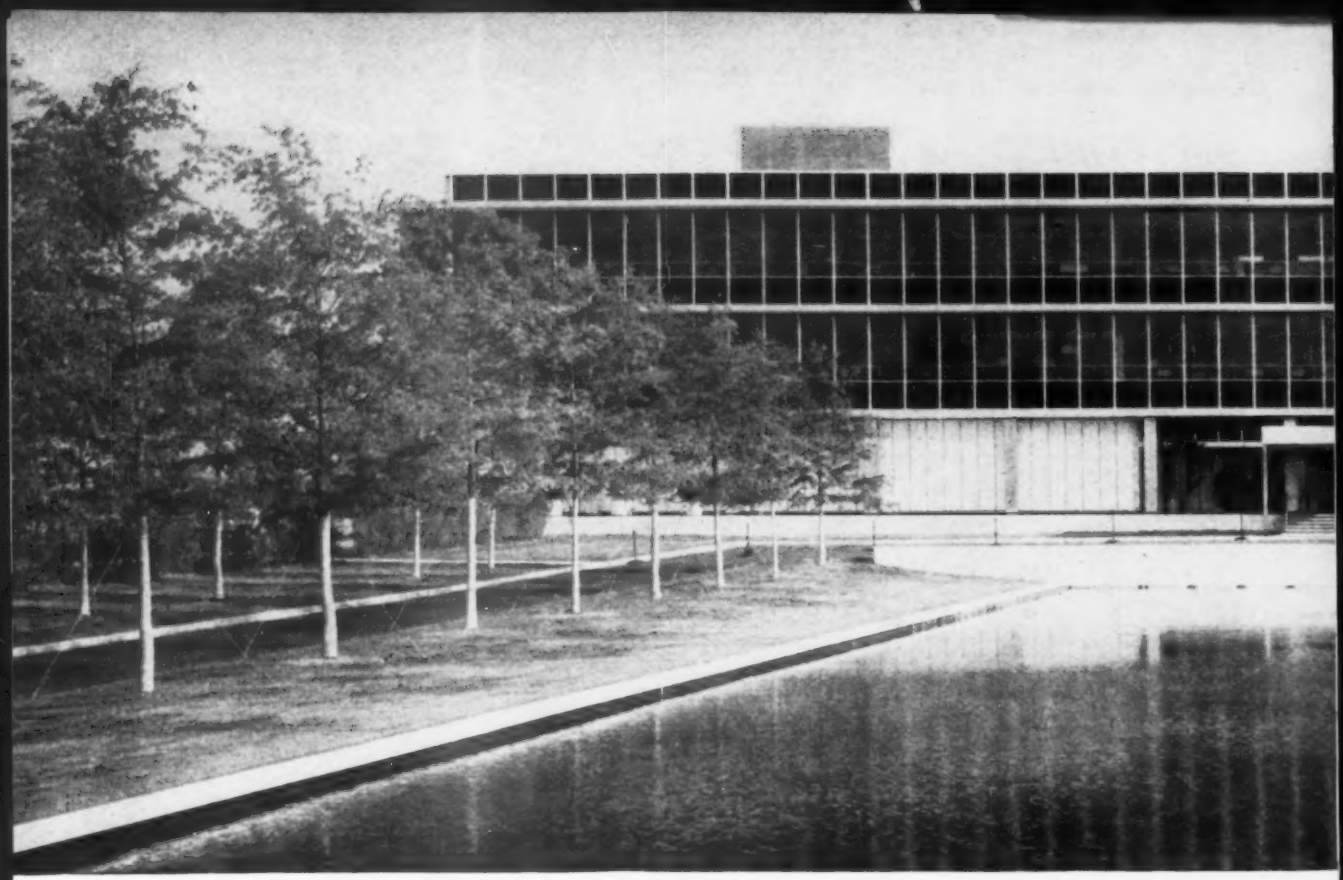


Maximum flexibility in space utilization is achieved at Reynolds through partitions that easily can be moved to expand or decrease area sizes. This can be accomplished without making costly changes in the lighting system. The Curtis wall-to-wall ceiling of light provides 80 ft. candles of maintained illumination. Attractive Hexcel Honeylite aluminum diffusers complement the inviting decor.

How a special Curtis Lighting system saved Reynolds Metals $50,000...

Here is the new home of Reynolds Metals Company, Richmond, Va. It is dramatically placed at the end of a reflecting pool bordered by willow oaks. The classic beauty of the building is enhanced by this unusual setting. Architect: Skidmore, Owings & Merrill; Consulting Engineer: Ebasco Services, Inc.

Unique all-aluminum folding grids in 100 sq. ft. units cut installation time 8,000 man hours . . . provided wall-to-wall illumination with low brightness quality

Installing a lighting system so flexible it can adapt to any internal building change without relocation is quite a feat. But when that is accomplished at important savings it calls for exceptional engineering ingenuity. That's what Curtis Visioneers achieved with a special custom-made aluminum folding grid system at Reynolds Metals Company, Richmond, Va. The unique folding "packages" made it possible to install 100 sq. ft. of lighting at one time. Result: a saving to Reynolds of an estimated 8,000 man hours, or approximately $50,000. A wall-to-wall ceiling of light was created with a beautiful satiny aluminum lighting tone of low brightness quality. Over-all ceiling illumination solved the problem of how to obtain stationary lighting for a 100,000 sq. ft. area, even though wall partitions would be moved in the future. Write today for the name and address of the representative in the principal city nearest you. Curtis-AllBrite Lighting, Inc. Chicago, 6135 W. 65th St. South San Francisco, 352 Shaw Road.

CURTIS All-Brite

Large office areas are as effectively illuminated as small areas with a high degree of visual comfort assured. In this special Curtis grid installation, aluminum materials were used throughout. Maintenance features of the system include ease of relamping, ready access to wiring, simple replacement of ballasts.

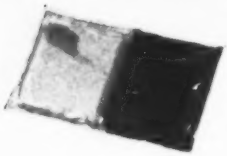
Inside story of

REG. U.S. PAT. OFF.

SCOTCHCAST BRAND Resin Splices

"SCOTCHCAST" BRAND Resin No. 4 is an epoxy resin developed especially for field splicing. Weathering, moisture, pressure, or general aging encountered in normal burial or overhead service does not affect it—field splices can now have the same modern, complete protection and insulation as shopcast motor coils, transformers, and condensers. Convenient kits assure positive electrical insulation, corrosion protection, moisture resistance, and trouble-free maintenance splice after splice!

"SCOTCHCAST" SPLICING KITS



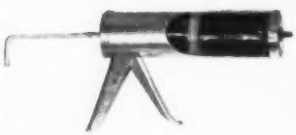
Kits feature "SCOTCHCAST" Resin No. 4 in single-use "Unipak" Container. Two-Part plastic bag contains resin and hardener. To use, bag divider seal is broken; laboratory correct mixture results. Resin is poured right from bag into mold; sets in minutes. Kits are for use on all non-shielded cable splices.

82-A Series Kits for straight or inline splices with cable O.D.'s from ¼" to 1⅛". Contains everything needed to insulate one splice: "SCOTCHCAST" Resin No. 4 in "Unipak"; mold halves; pouring spouts; sealing tape. Cutaway photo shows complete blocking of moisture-entry points.

82-B Series Kits for excellent electrical and physical protection of wye splices with cable O.D.'s from ¼" to ⅜". Cut-away shows moisture proof penetration of "SCOTCHCAST" Resin No. 4 into all voids of splice mass.

90-B1 Kit for positive protection of wye or tap splice, insulation over split-bolt connectors or control cable taps. For surface or underground uses. Like all "SCOTCHCAST" Kits, assembles quickly and easily; gives electrically tight splice protection without need of special skills.

"SCOTCHCAST" RESIN PRESSURE SPLICE



With the "SCOTCHCAST" Resin Pressure Method, cable splices and terminations, regardless of size or configuration, can be insulated easily . . . difficult jobs such as shielded cable splices, terminations, and sheath repairs are readily accomplished. Method utilizes "SCOTCHCAST" Resin No. 4 in "Unipak" container injected into a screen-fabricated mold by specially designed pressure gun.

Cut-away inline splice shows complete penetration of resin with pressure-splice method. Will insulate splices on rubber, synthetic or lead insulation or sheath cable . . . shielded and unshielded.

Shielded wye splices are easily handled with "SCOTCHCAST" Pressure Splice Method. Shielding continuation is built into the splice insulation. Total moisture and physical protection is an extra feature of this method.

Outdoor cable termination illustrated is for use at 9 KV. Lower cutaway portion shows stress cone. Entire termination—including stress cone—is resin saturated in one operation. Available in building block components up to 15 KV.

The versatility of the "SCOTCHCAST" Splice Protection System is such that nearly any type of cable connection or termination can now be resin insulated. Our representatives will be glad to advise or assist you in adapting "SCOTCHCAST" Kits and Pressure Methods to your needs. Just write on your letterhead.

FREE BOOKLET describes "SCOTCHCAST" KITS and Pressure-Splice Method. Illustrates applications; details electrical properties. Write: 3M Co., 900 Bush Ave., St. Paul 6, Minn., Dept. EAV-99.

"SCOTCHCAST" IS A REGISTERED TRADEMARK OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 16. CANADA: LONDON, ONTARIO

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

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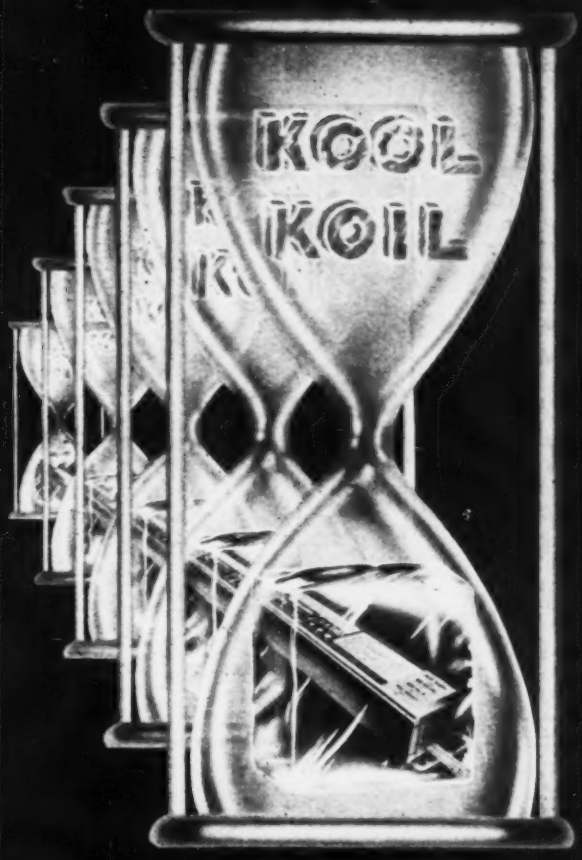


The Advantages of ADVANCE KOOL KOIL Fluorescent Lamp BALLASTS Come in 1969

As time goes into the 1970's, you'll find ADVANCE Kool Koil Fluorescent Lamp Ballasts operating long after others have failed.

ADVANCE engineers tested new grades of steel, larger diameter wire . . . developed special insulating materials and compounds . . . separated vital components in the ballast case so the capacitor would operate at temperatures far below its guarantee limits. Then, after three years of this exhaustive research ADVANCE perfected Kool Koil Fluorescent Lamp Ballasts . . . ballasts which operate 16.5°C. to 19.5°C. lower than any other ballast tested in a standard 40°C. C.B.M. and U/L heat box.

Because ballast life is cut in half for every 10°C. over normal operating temperatures, Kool Koil Ballasts operating up to 20°C. cooler give you extra years of trouble-free ballast operation and added protection that ends costly maintenance and interruptions in service.

Always insist on Kool Koil Fluorescent Lamp Ballasts . . . the extra benefits will come as time goes into the 1970's . . . and after.

"The Heart of the Lighting Industry"

ADVANCE®

World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

TRANSFORMER CO.

2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

For phone number of closest representative see advertising index in back of book.

HOW THE ALUMINUM IN K/W INTERLOCKED ARMOR CABLE SAVES YOU MONEY...SPEEDS YOUR JOB

K/W 3 Conductors Interlocked Armor Cable Spec. 808-S vs. 3 Copper Cdrs. in Steel Conduit
COST AND WEIGHT COMPARISON—1000 FT.

600V RHW 75°C RUBBER 3 Copper Cdrs. in Steel Conduit							600V ALUMINUM INTERLOCKED ARMOR Aluminum Conductors, 90°C, Butyl Insulation						SAVINGS WITH ALUMINUM				
Wire Size	Amps.*	CONDUIT Trade Size In.	CONDUIT O.D. Inches	CONDUIT Area Sq. In.	Total Wt.—Lbs.	Total Cost—$	Wire Size	Amps.**	O.D. Inches	Area Sq. In.	Total Wt.—Lbs.	Total Cost—$	% Bonus Ampacity Alum. over Copper	SAVINGS (1) $	SAVINGS (1) %	Weight Savings Lbs.	Space Savings %
2	115	1¼	1.66	2.17	2,860	903.	1	120	1.44	1.63	850	713.	4.3	190.	27	2,010	25
1	130	1½	1.90	2.82	3,570	1,155.	1/0	135	1.53	1.84	960	806.	3.8	349.	43	2,610	35
1/0	150	2	2.38	4.44	4,660	1,457.	2/0	160	1.63	2.07	1,115	926.	6.7	531.	57	3,545	53
2/0	175	2	2.38	4.44	4,960	1,609.	3/0	180	1.74	2.38	1,285	1,093.	2.9	516.	47	3,675	46
3/0	200	2	2.38	4.44	5,350	1,814.	4/0	205	1.87	2.74	1,550	1,265.	2.5	549.	43	3,800	38
4/0	230	2½	2.88	6.51	7,730	2,508.	250	230	2.04	3.27	1,840	1,522.	0	986.	65	5,890	50
250	255	2½	2.88	6.51	8,190	2,883.	300	255	2.16	3.66	2,080	1,751.	0	1,132.	65	6,110	44
300	285	2½	2.88	6.51	8,700	3,171.	350	285	2.27	4.04	2,325	1,870.	0	1,301.	70	6,375	38
350	310	3	3.50	9.62	10,860	3,752.	400	305	2.37	4.41	2,560	1,998.	−1.6	1,754.	88	8,300	54
400	335	3	3.50	9.62	11,370	4,053.	500	355	2.56	5.14	2,990	2,260.	6.0	1,793.	79	8,380	46
500	380	3	3.50	9.62	12,390	4,748.	600	395	2.79	6.11	3,545	2,615.	3.9	2,133.	82	8,845	36
700	460	3½	4.00	12.57	15,930	6,459.	750	455	3.02	7.16	4,175	3,151.	−1.1	3,308.	105	11,755	43

* Based on 1956 N.E. Code ** 90°C Conductor—40°C Ambient. Note—Comparison of 75°C RHW and 90°C Butyl K/W Spec. 107. Current prices, 4-29-59.
(1) Savings based on increased cost of copper and steel over aluminum cable. Weights and prices for 1000 ft.

1. LESS COST

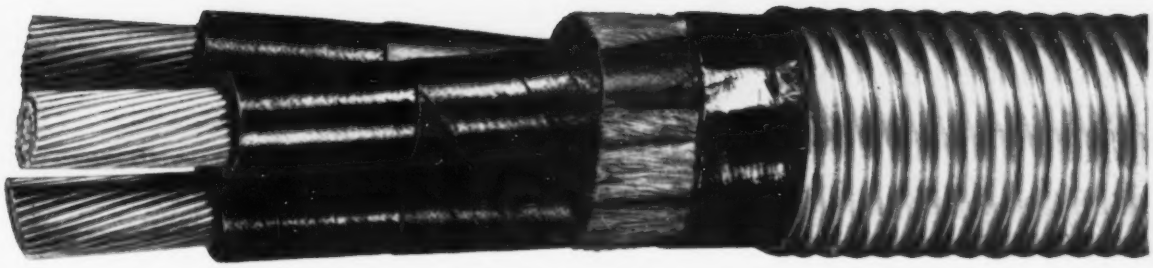
You realize important savings on *materials* with KW Aluminum Interlocked Armor Cable because (1) it gives you greater current-carrying capacity per dollar, (2) the nature of its aluminum armor eliminates costly conduit. Also, you save on *costly labor* because KW's corrosion resistant aluminum armor holds upkeep to a minimum, even in highly corrosive areas.

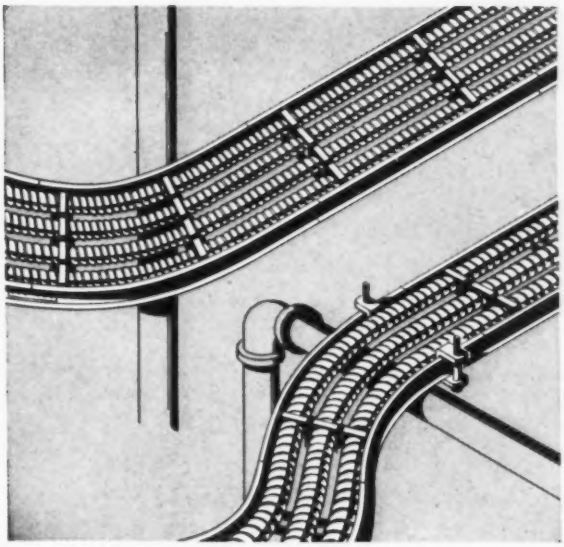
2. LESS WEIGHT

Any interlocked armor weighs far less than heavy, bulky steel conduit. But KW gives you *additional* weight savings because its armor is aluminum—weighing only ⅓ as much as steel or bronze. Moreover, because the conductors are also made of aluminum, they are less than half the weight of copper conductors that carry the same amount of current.

Versatile Use. KW Aluminum Interlocked Armor Cable is the ideal answer for industrial and commercial distribution systems, generator leads and auxiliary cable installations.

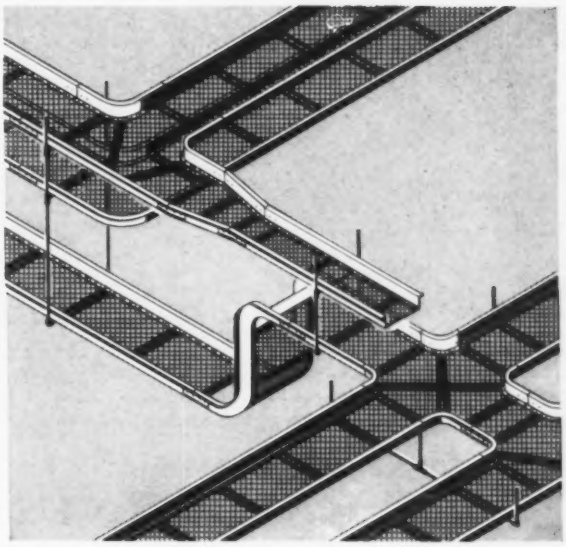
For complete information, call the Kaiser Aluminum sales office or KW distributor listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, Calif.





3. FASTER INSTALLATION

The light weight and supreme flexibility of KW Aluminum Interlocked Armor Cable mean easier handling, cut installation time in half. It can easily be bent horizontally or vertically around impeding objects and laid in longer lengths, eliminating the need for frequent splicing. In addition, because its diameter is less than conventional conduit systems, compact KW cable can bring space savings of up to 54%.



4. SPEEDIER MODIFICATIONS

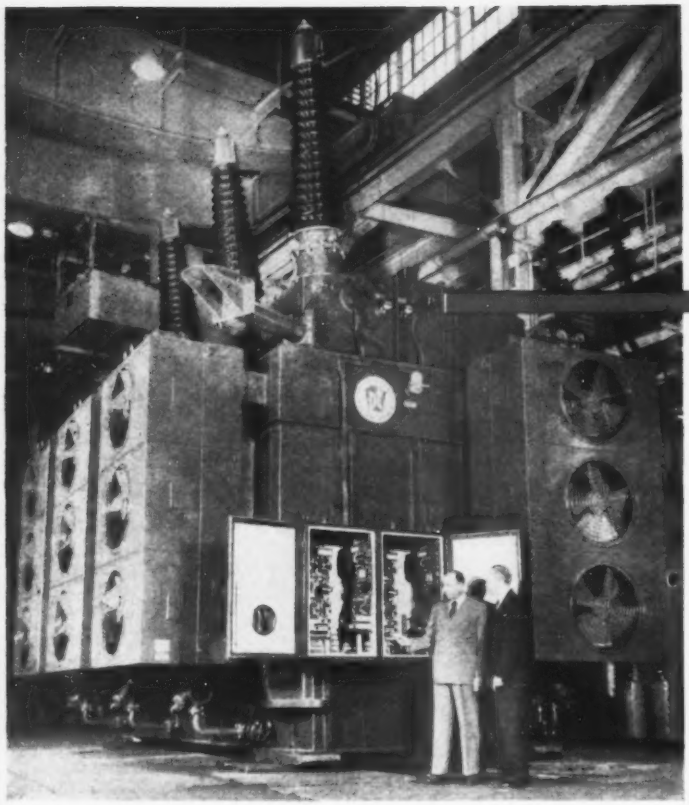
KW Aluminum Interlocked Armor Cable may be laid on readily accessible racks, trays and troughs . . . or hung from a messenger. It is a quick and simple matter to expand KW Interlocked Armor Cable systems to meet increased power requirements which may arise after installation.

KAISER ALUMINUM

"If It Carries Current, KW Carries It!"

See "MAVERICK" • Sunday Evenings, ABC-TV Network.
Consult your local TV listing.

For phone number of closest representative see advertising index in back of book.



315,

...OUR BIGGEST TO DATE

We at Pennsylvania Transformer Division, McGraw-Edison Company want you to be aware of our ability to meet the largest power transformer requirements. Our advertising frequently calls attention to this ability by picturing plant facilities, just-completed large power transformers, and installations of our transformers at generating stations.

This time our production department (bless 'em!) has helped dramatize our story by completing two large Contour Design shell-form transformers—totaling 465,000 kva—within a few hours of each other. While this sort of close scheduling is not exactly routine, it is noteworthy that both transformers went through the plant on a "work-as-usual" basis with no overcrowding or taxing of facilities.

The transformer on the righthand car—the largest Pennsylvania has ever made from the standpoint of capacity—is a 315,000-kva main step-up generating station transformer for a midwestern utility. High voltage: 230,000 GrdY/132,800 volts. Low voltage: 17,200 Δ volts.

The transformer on the lefthand car—destined for an eastern utility—is a 150,000-kva load tapchanging transformer. High voltage: 220,000 GrdY/127,000 volts. Low voltage: 69,000 GrdY/39,800 volts, with LTC equipment for plus or minus ten percent regulation in 32 steps of $\frac{5}{8}\%$ each. Tertiary voltage: 13,800 Δ volts.

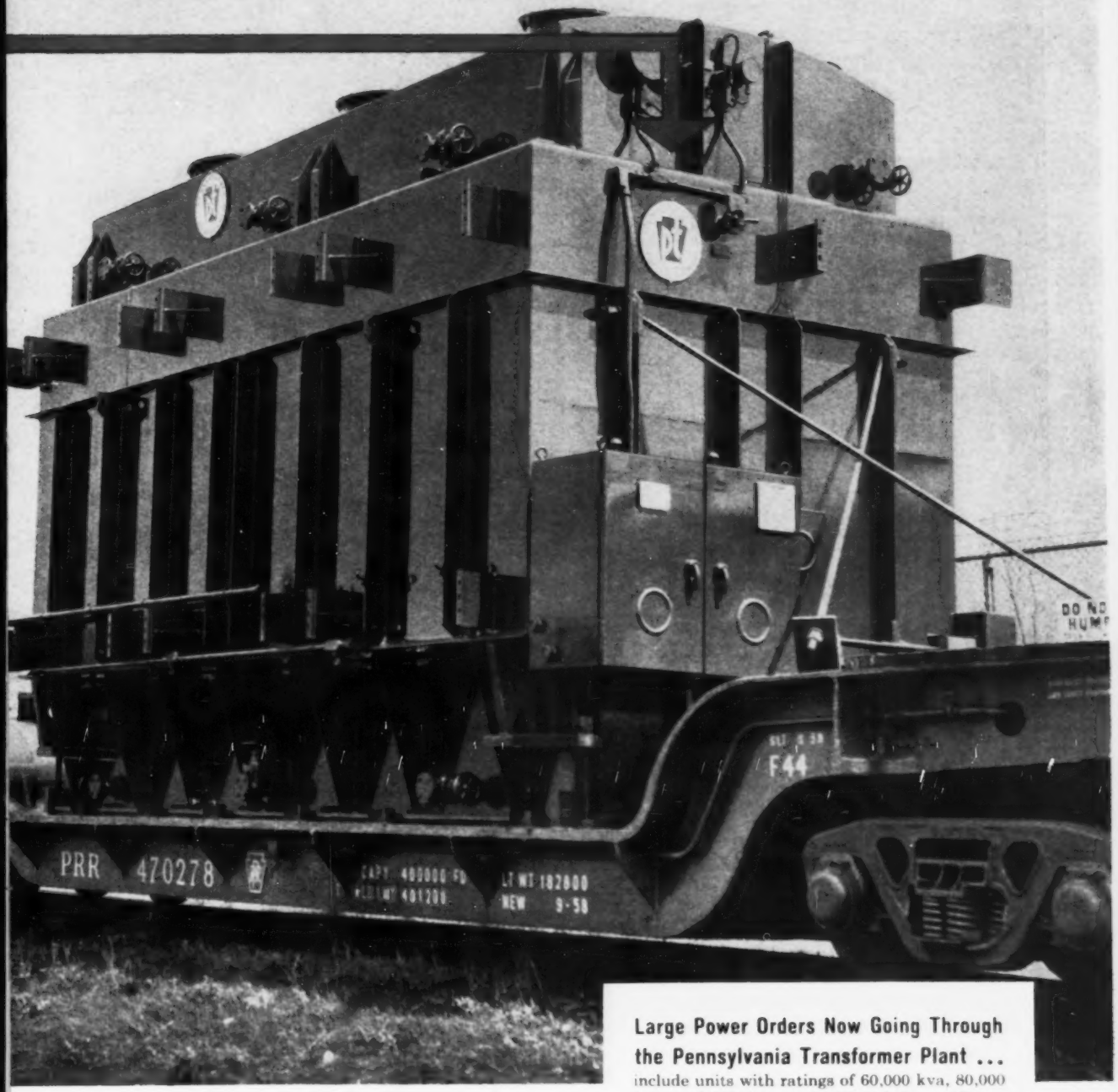
We'd like to quote on *your* next power transformer needs. Large or small . . . with or without LTC . . . shell-form or core-form, we have the facilities and the experience to meet your most exacting requirements. Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW-EDISON

PENNSYLVANIA TRANSFORMERS

PENNSYLVANIA POWER

000 KVA

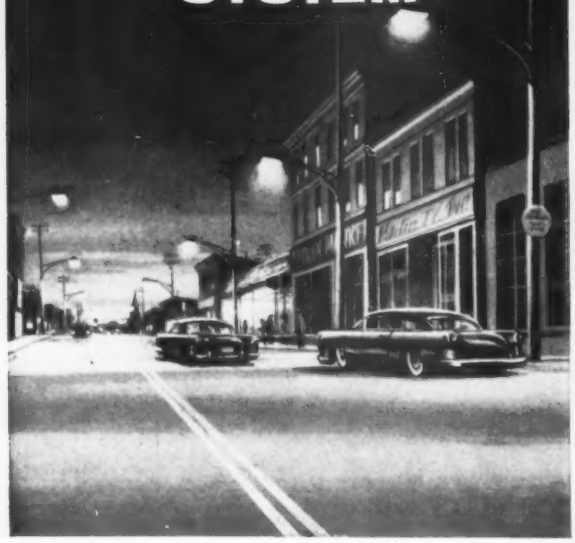


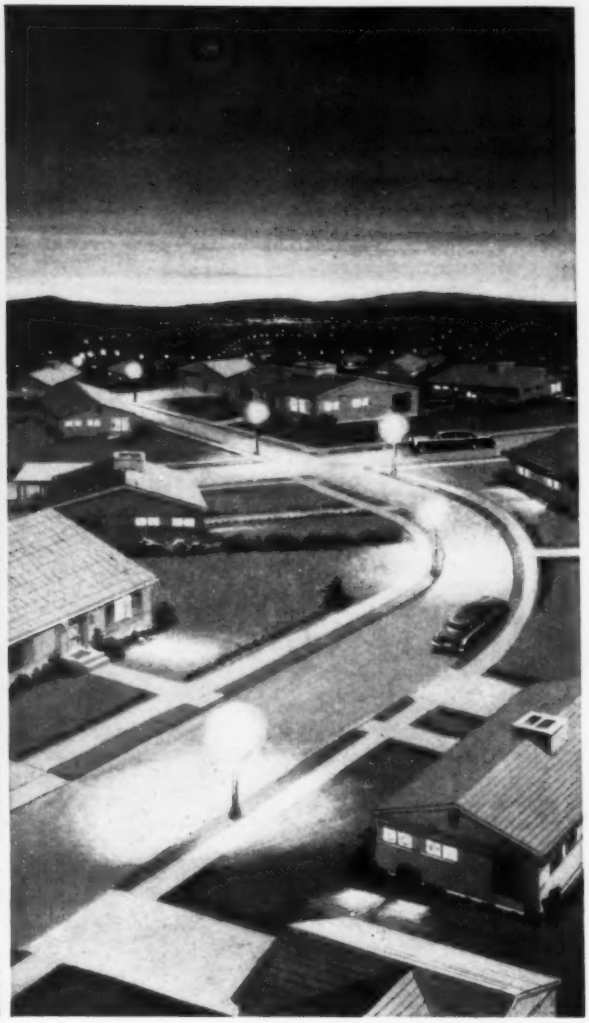
Large Power Orders Now Going Through the Pennsylvania Transformer Plant ...

include units with ratings of 60,000 kva, 80,000 kva, 100,000 kva and 260,000 kva. All are scheduled for completion within approximately one month. In addition, Pennsylvania is preparing to build a 460,000-volt transformer for an eastern utility company's forthcoming experimental transmission lines.

TRANSFORMERS

TRIANGLE has a cable for every STREET LIGHTING SYSTEM





Each street lighting job has different requirements calling for a specialized type of cable. Triangle has four basic types—each designed to handle a specific set of service conditions. The distribution engineer can select the *one right kind* for his situation, eliminating costly overdesigning and preventing system outages due to underdesigning.

* Triozone insulated, Trioprene sheathed—Series Street Lighting Cable. Single conductor cable for direct burial and duct installation. 2001 to 5000 volts.
* Rubber insulated, lead sheathed—Series Street Lighting Cable. Single conductor cable, available with or without double steel tape armor. 0 to 5000 volts.
* Trioseal or Triolene insulated—Series Street Lighting Cable. Single conductor cable. Extra thickness of insulation available for severe service. 0 to 5000 volts.
* Trioseal insulated, Triolene sheathed—Pole and Bracket Cable Twin conductors. 4001 to 10,000 volts.

These cables are described in a new bulletin, just off the press.
Write for your copy.

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

For phone number of closest representative see advertising index in back of book.

struction at this point. Each terminal is equipped with a clamp-type connector to take leads up to No. 6 AWG. ●

to take No. 2 AWG to 300 MCM cable. This makes a tight, low-resistance connection to the line conductor. ●

remote indication accurate to 1.0 per cent can be obtained with a totalizing d-c current transformer system.

New Electric Utility Study Could Herald Advent of Standardization on 200-amp Capacity Meters

TEST RESULTS FROM 21 ELECTRIC UTILITIES PROVE CLASS 200 METERS EQUAL PERFORMANCE OF CLASS 60 AND 100's AT ALL LOADS

SOMERSWORTH, N. H.—One of the most important questions currently facing electric utilities was answered today when the General Electric Company released results of a nation-wide, in-series test comparison of Class 200 versus Classes 60 and 100 watthour meters.

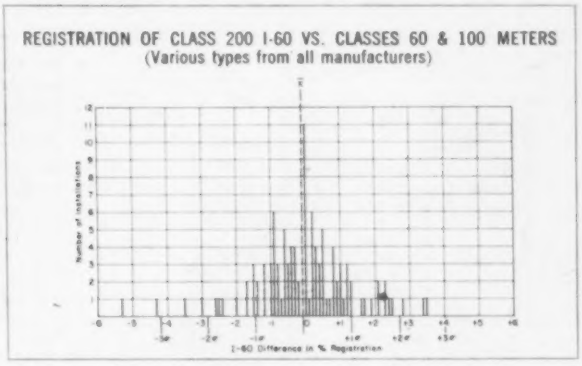
Conducted by 21 utilities at the invitation of General Electric's Meter Department, the tests showed conclusively that Class 200 meters—such as G.E.'s I-60—can equal or better the performance of any existing single-phase meter at all loads up to 200 amperes.

At each of 114 residential test sites, a Class 200 meter was mounted on the line side of, and in series with, either a Class 60 or a Class 100 meter. Meters of four manufacturers were used in the tests which extended over periods ranging from seven days to ten months.

On the strength of this series comparison test study, more electric utilities could decide to standardize on Class 200 metering to simplify purchasing routines and reduce meter inventories.

Data contained in this series comparison test report can also be utilized to compare the performance of competitive Classes 60, 100 and 200 meters. Complete copies of the study can be obtained from G.E. by filling out and returning the coupon on the next page.

In comparison tests, the Class 200 meter was placed on the line side in series with the billing meter. Meters were 3-wire, 240-volt.



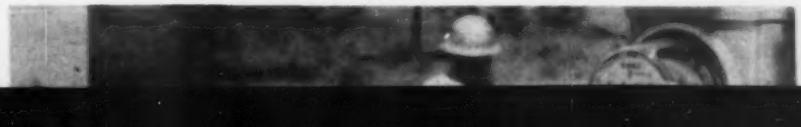
Typical series test chart from G.E.'s report compares performance of G.E.'s Class 200 meter versus 114 Classes 60 and 100 billing meters.

PLEASE TURN PAGE

GENERAL ELECTRIC

ACCURACY (Testing)

The primary winding is of the continu-



the core and other grounded structure consists of compound cylinders, kraft pressboard collars, and barriers. ●

tional a-c current transformer is of a window-type design which slips over the d-c bus or cable.

parts during transportation and installation. The entire core and coil structure is suspended from the tank cover. ●

Electric Utility Comparison Tests Prove General Electric I-60 Watthour Meters Outperform Competitive Class 200 Meters

SOMERSWORTH, N. H.—One fact stood out clearly today as results of a nation-wide, in-series test comparison of Class 200 versus Classes 60 and 100 watthour meters were announced. It was that General Electric's Class 200 I-60 single-phase meter's performance is "significantly better" than that of competitive Class 200 meters.

The tests—conducted by more than a score of electric utility companies—consisted of individual residential applications of a Class 200 meter mounted in series with a Class 60 or Class 100 billing meter. Comparison test results from each utility were forwarded to General Electric where they were compiled, categorized and factored into an overall report. The combined results are sufficiently large to permit fair comparisons and unbiased conclusions.

Meters of four manufacturers were used in the series comparisons, and test periods extended from seven days to ten months. In summary, here's how the four Class 200 meters performed:

PERCENT DIFFERENCE IN CLASS 200 METER REGISTRATION	
G.E.	−.28%
MFR. A	−.72%
MFR. B	−1.18%
MFR. C	−.55%

Electric utility comparison test results show General Electric's I-60 is today's best-performing Class 200 meter.

The superior performance of General Electric's I-60 meter is attributable in large part to its unequalled "on-line" accuracy at all loads—from the smallest lighting loads to heavy house-heating and air-conditioning loads. In addition, the I-60 features G.E.'s unique magnetic suspension—a truly lifetime bearing system. More than 10,000,000 General Electric meters with magnetic suspensions are in service today, without a single failure of the "floating disk" being reported.

Copies of the complete series comparison test report are available now from General Electric. To obtain your copy, fill out and return the coupon below.

Cut along dotted line

FOR FREE COPY OF COMPLETE, TWO-YEAR ELECTRIC UTILITY COMPARISON TEST-STUDY FILL OUT AND RETURN THIS COUPON

General Electric Company
Section 628-30
Schenectady 5, New York

Please send me a copy of bulletin GET-3025, "Series Comparison Tests of Classes 60 and 100 versus Class 200 Single Stator Watthour Meters."

Name _____

Title _____

Company _____

Street _____ City _____

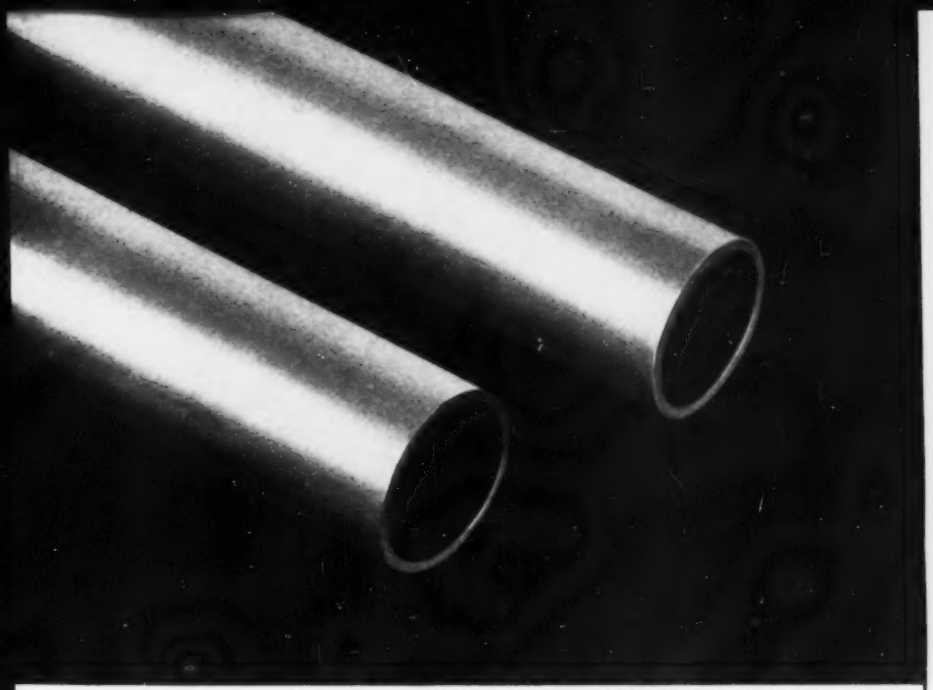
State _____

Progress Is Our Most Important Product

GENERAL ELECTRIC

LIFE BACKGROUND

Thinking on the subject of mechanical demand registers is still influenced to



Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Even EMT can look good ...if it's CIRTUBE* EMT

TRUE, the first things you look for in EMT are: one, is it easy to work with—two, is it made to give lasting protection. CIRTUBE EMT, by the way, rates tops on both. But there's no reason why EMT can't *look* good as well!

That's where CIRTUBE EMT "shines," too. Reason for its pleasing polished satin lustre is the cyanide zinc plating process Circle uses (even though it costs a little more to apply than other methods).

The zinc bond is better, too—won't chip or flake off. That's because Circle employs elaborate cleaning processes to make sure that the steel is absolutely clean before plating.

Quality finish is only one of many reasons why CIRTUBE EMT has gained such wide acceptance in so short a time. Why not try it next time you order—you'll like it.

*Trade Mark

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*

Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

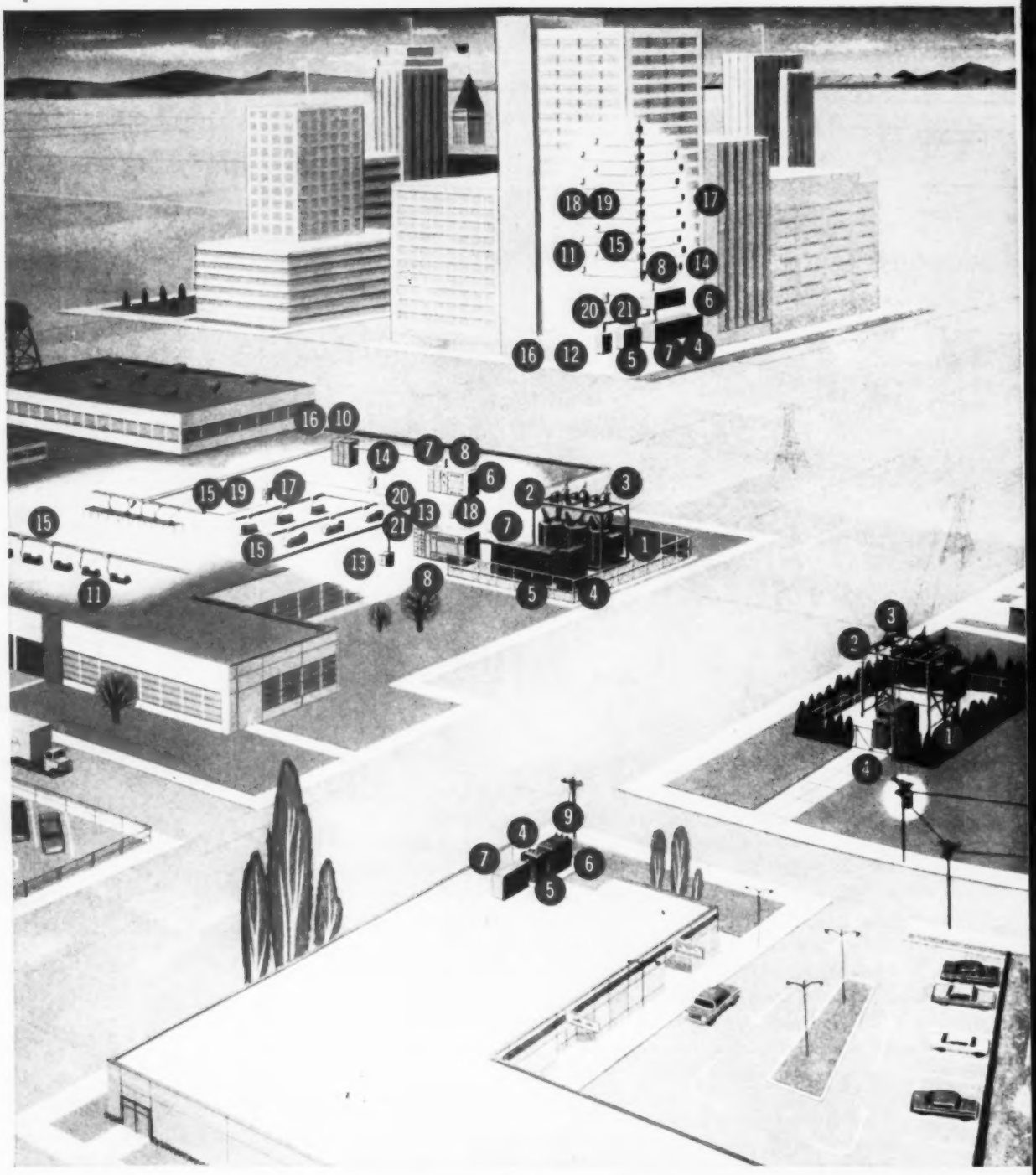
Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.

Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.



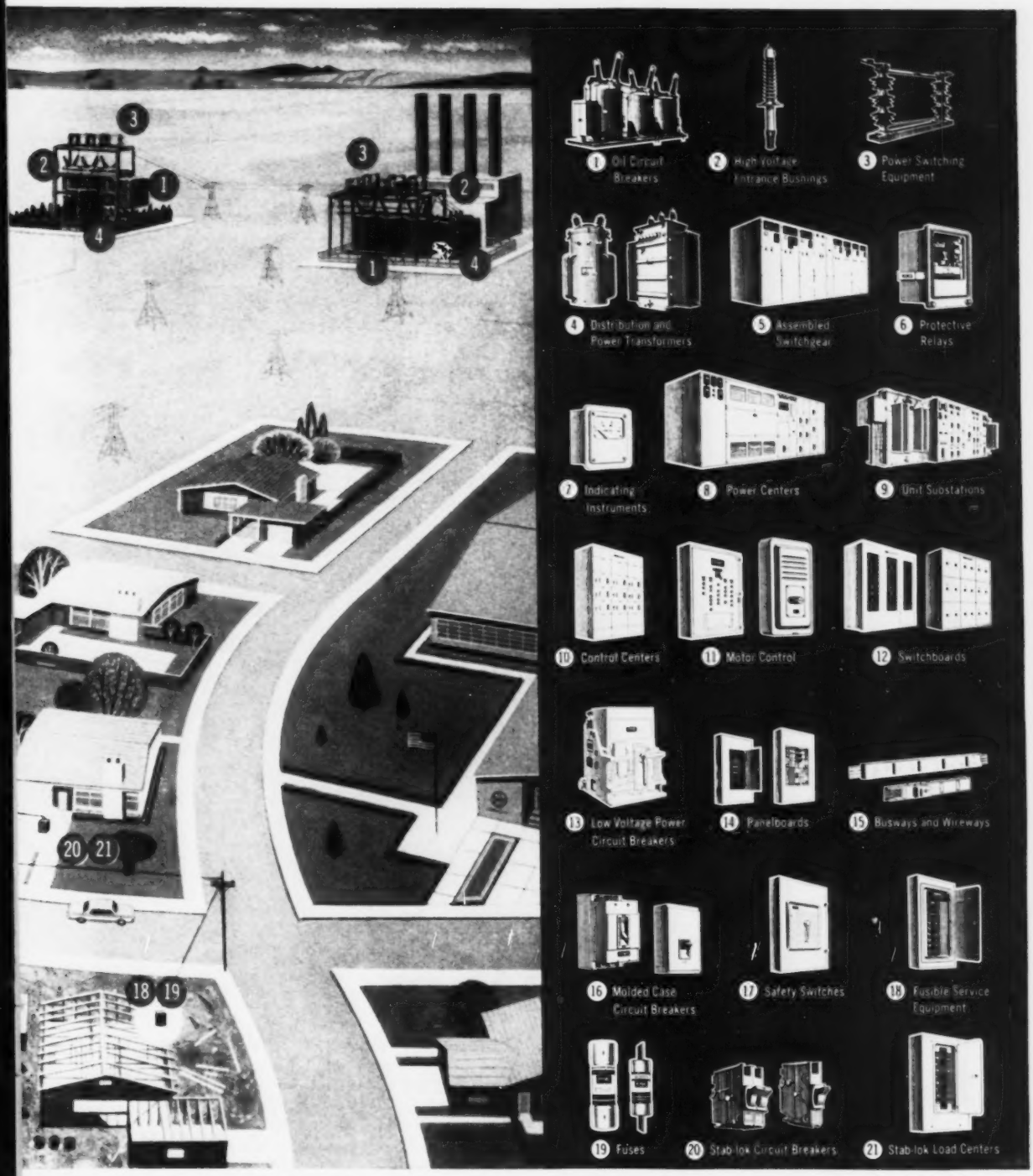
A complete line of quality electrical

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

General Offices: 50 Paris Street, Newark 1, New Jersey

For phone number of closest representative see advertising index in back of book.



distribution and control equipment

FOR HOMES, COMMERCIAL BUILDINGS, INDUSTRIAL PLANTS and UTILITY SYSTEMS

virden announces a new concept in home lighting

the light idea

to increase your sale of home lighting fixtures

Now you can sell lighting . . . not just fixtures! Match your customers' mode of living with the *right lighting* for every occasion . . . and gain more sales . . . more profits.

"the light idea" by Virden makes it possible. It matches lighting to today's living patterns . . . *creates the right lighting mood* for every occasion . . . from overall illumination through accent and protective lighting.

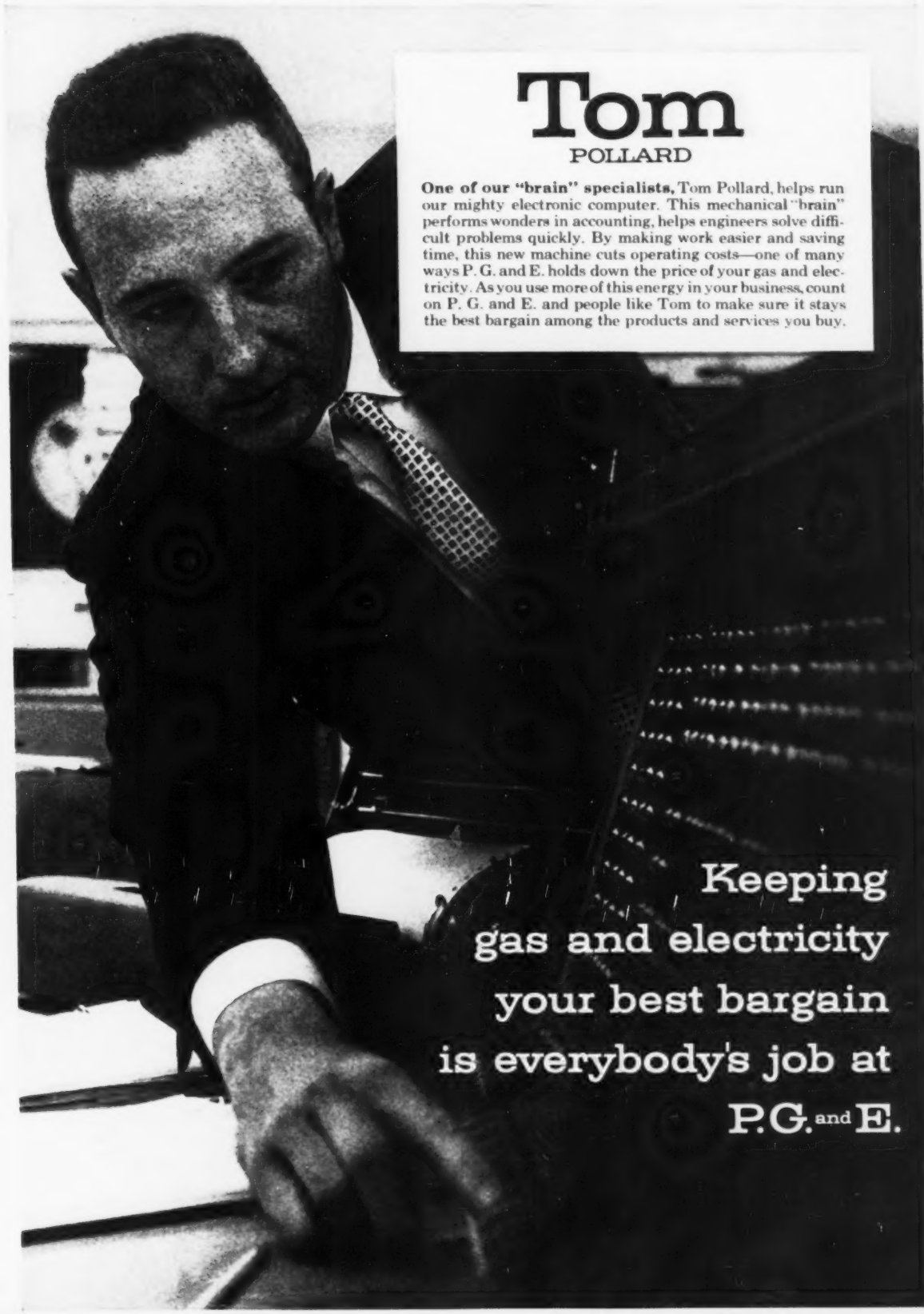
Our new 52-page, full color catalog explains "the light idea" in detail, shows and tells how to achieve it. In addition, it shows the complete new Virden line . . . new pulldowns, chandeliers, bullets . . . outdoor and garden lighting . . . in every decorator style. Truly the most brilliant collection in the industry.

Ask your Virden distributor for your copy today. You'll find him listed in the Yellow Pages under "Lighting." Or write to Virden Lighting, Dept. ELW, 5209 Euclid Avenue, Cleveland 3, Ohio.

virden LIGHTING

A Division of the John C. Virden Company • Cleveland 3, Ohio • In Canada, John C. Virden, Ltd., Toronto 16, Ontario

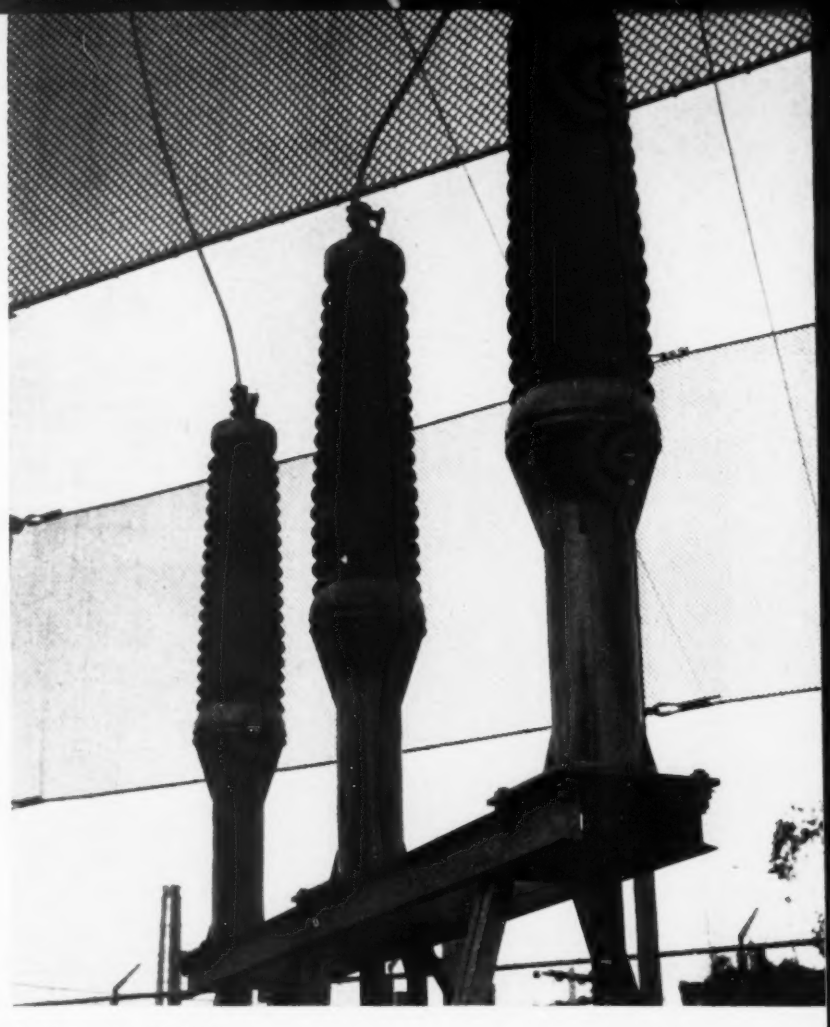
For phone number of closest representative see advertising index in back of book.


Tom
POLLARD
One of our "brain" specialists, Tom Pollard, helps run our mighty electronic computer. This mechanical "brain" performs wonders in accounting, helps engineers solve difficult problems quickly. By making work easier and saving time, this new machine cuts operating costs—one of many ways P. G. and E. holds down the price of your gas and electricity. As you use more of this energy in your business, count on P. G. and E. and people like Tom to make sure it stays the best bargain among the products and services you buy.
Keeping gas and electricity your best bargain is everybody's job at P.G. and E.

Pacific Gas and Electric Company

ANOTHER FIRST from G&W

"a significant step forward in the termination of high-voltage cable"*



The first use of a commercially available

138 kv HIGH PRESSURE ALL-GAS POTHEAD

in which the porcelain is subjected to full line pressure

The very first pothead to be used commercially was designed by the founders of G&W. Over fifty-five years later and many other "firsts," G&W engineers have produced the most complete line of potheads available to industry. You can specify the pothead of your choice with utmost confidence.

G&W experience, engineering skill, and the manufacturing resources at its command are second to none. They are your positive guarantee of satisfaction.

Write today for your copy of "MORE POWER DOWNTOWN".

* *This quote is from an authoritative article titled, "More Power Downtown". The article gives full facts on new ideas used in the construction of a 110 kv underground system on the West Coast. Describes techniques you'll want to know about—"must" reading. Send for your copy today.*

G&W ELECTRIC SPECIALTY CO.

3506 W. 127th Street • Blue Island • Illinois

Canadian Mfr. —Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

HOW CBM ASSURES YOU BETTER BALLAST VALUE

ETL checks 12 to 14 specified ballast characteristics on all Certified types in production by each manufacturer, verifies compliance by test . . . and does it every month!

SPECIFIED performance is checked by test . . . that's why you can always rely on Certified CBM ballasts for dependable lighting service.

What characteristics are checked? The operating qualities which the American Standards Association has determined will give dependable, rated performance from the lamps with which the ballasts are designed to be used. These constitute the CBM Specification and assure:

High power factor • High light output • Positive starting • Rated lamp life • Limit on heat rise • Control for steady light • Quiet operation

From these qualities come practical benefits: Up to 2,500 hours more lamp life than with ordinary ballasts; as much as 40% more light output; and savings on installation . . . with less wire, fewer circuits needed for fixtures CBM equipped . . . fewer fixtures for the same level of light.

For the latest facts on why it pays to specify fixtures equipped with Certified CBM Ballasts, ask us to send you CBM NEWS.

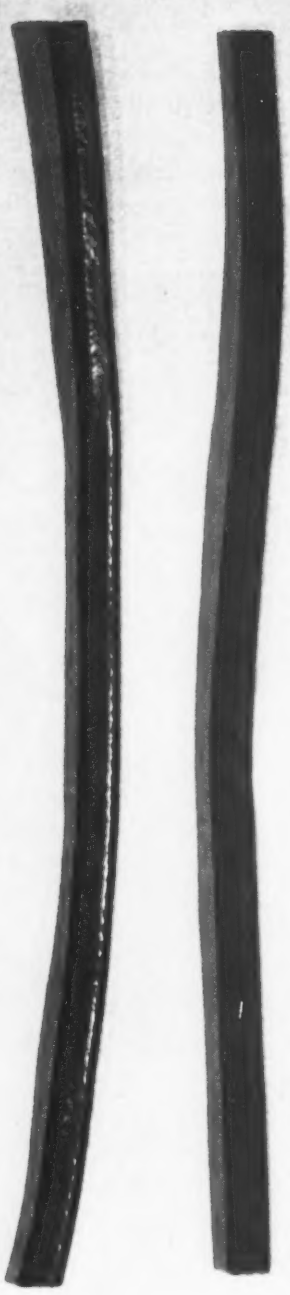
CBM CERTIFIED by ETL

CERTIFIED BALLAST MANUFACTURERS

2111 KEITH BUILDING
CLEVELAND 15, OHIO

Participation in CBM is open to any manufacturer who wishes to qualify

2-59



Which one is brand new?

Which wire has 12½ years of service?

Both specimens in the photograph are protected with a tough durable covering of neoprene. And that's why you can hardly tell the difference between old and new. The one on the left has been in outdoor service in northern California for 12½ years, yet it still looks as good as the new one on the right.

Performance like this proves neoprene's ability to withstand sun, weathering and aging. It is the reason many telephone companies have standardized on neoprene jacketing.

Neoprene also resists chemicals, temperature extremes, impact damage and cold flow. This time-tested jacketing material assures you long-term protection and economy.

Neoprene-jacketed wire manufactured by Whitney-Blake Co.

For more information about neoprene write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. ET-9, Wilmington 98, Del.

DU PONT

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

Better Things for Better Living . . . *through Chemistry*

A NEW ERA IN RELAY LIFE AND RELIABILITY!

A-B QUALITY

THEY MAY LOOK ALIKE, BUT

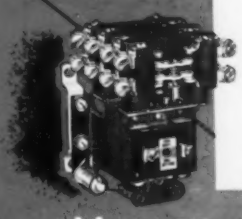
these new relays completely outmode the usual concepts of relay life and reliability.

For years the Allen-Bradley Bulletin 700 Type B and Type BX relays have been preferred for their long life and their consistent, trouble free operation. In having produced millions of these relays, we learned how to improve them. Thus, the new line of Type B and Type BX relays was designed to set a new level of performance standards.

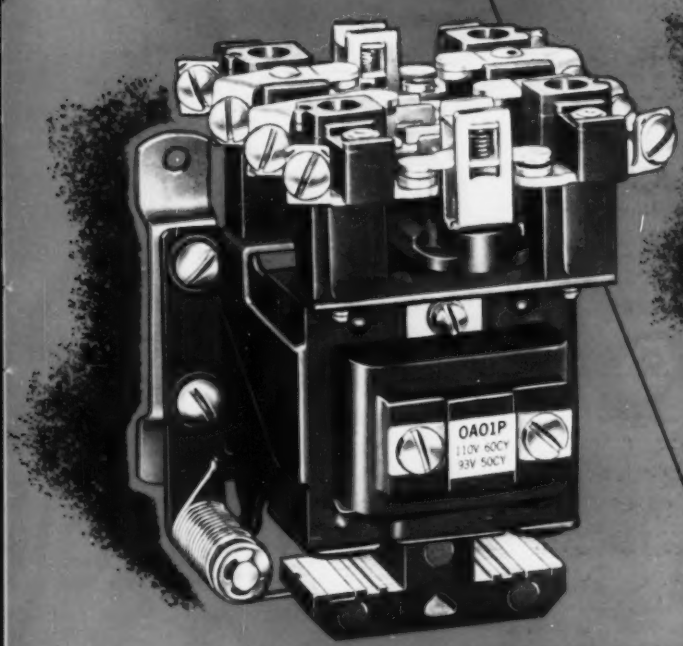
Turn the page and see the outstanding features of these new Bulletin 700 Type B and Type BX relays. For the same price, they offer you even greater value, greater reliability.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

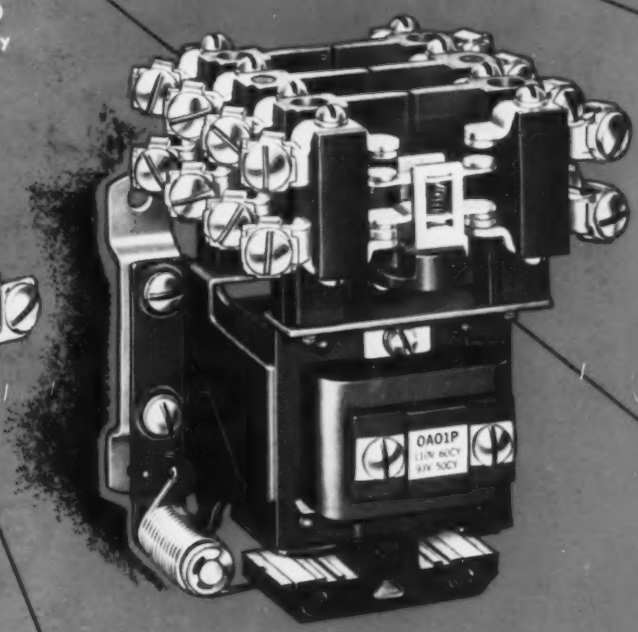
old Bulletin 700
Type B-400 Relay
with 4 N.O. contacts



old Bulletin 700
Type BX-440 Relay



new Bulletin 700, Type B-220A
AC Control Relay with 2 N.O. and 2 N.C. contacts



new Bulletin 700, Type BX-440A
AC Control Relay can be wired for normally open or normally closed contacts

ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

7-59-MR

NEW BULLETIN 700 RELAYS

TYPE B AND TYPE BX

provide these improved features

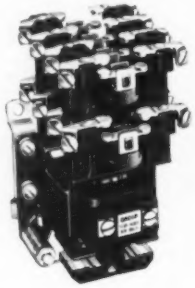
1. New mechanical design gives *at least* 5 times greater operating life.
2. New contact motion provides 10 times greater electrical reliability.
3. Compact construction—new relays are structurally improved with no change in size.
4. Complete interchangeability. Mounting dimensions of new relays have not been changed.
5. Rugged, high efficiency cast plastic coil. New, improved coil fits *all* Bulletin 700 relays.
6. New, stronger, movable contact crossbar—fits Bulletin 700 relays now in service.
7. Improved stationary contact blocks. These new blocks can also be used on present models of the Bulletin 700 relay.
8. Increased life and reliability—*no increase in cost.* These new, improved relays are priced the same as previous Allen-Bradley models.
9. The letter A is added to the Bulletin 700 relay type number merely to distinguish the new line.
10. These new relays are Allen-Bradley's "thank you" to our many customers who have bought millions of Bulletin 700 relays over the years.

A-B QUALITY

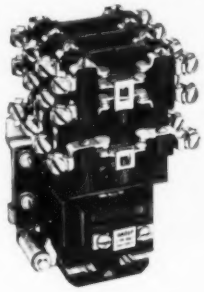
The old Bulletin 700 relay was first placed on the market some 25 years ago. Today, millions of these relays are in daily service—all over the world.

None of the old relay "values" have been lost in the new designs. Instead, these "values" have been greatly improved. The new relays feature a simplified, longer life, solenoid construction. The double break, silver alloy contacts are the same—always in perfect operating condition—without cleaning or filing. The operating coil has been greatly improved—it cannot be damaged by atmospheric conditions, no matter how severe.

No one can deny the popularity of the older Bulletin 700 relays. The new relays—with their superior features—will be an even better answer for any and all relay applications.



TYPE B, GENERAL PURPOSE
Bulletin 700, 8-pole relay. Made with 8 N. O. and no N. C., or up to 4 N. O. and 4 N. C. contacts.



TYPE BX, UNIVERSAL
Bulletin 700, 8-pole relay with both N. O. and N. C. contacts. Changeover is made by reconnecting incoming lines.

HERE IS ANOTHER REMARKABLE ADDITION TO THE ALLEN-BRADLEY RELAY LINE

It's new . . . and it's different. This unusual Bulletin 700 convertible contact relay has contacts that can be changed from normally open to normally closed operation (or vice versa)—in just moments. A screwdriver is all it takes to do the job—no additional parts are needed. Like all A-B relays, it's good for millions of trouble free operations. Watch for announcement and full details of this new convertible relay soon!

ALLEN-BRADLEY

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

7-59-MR

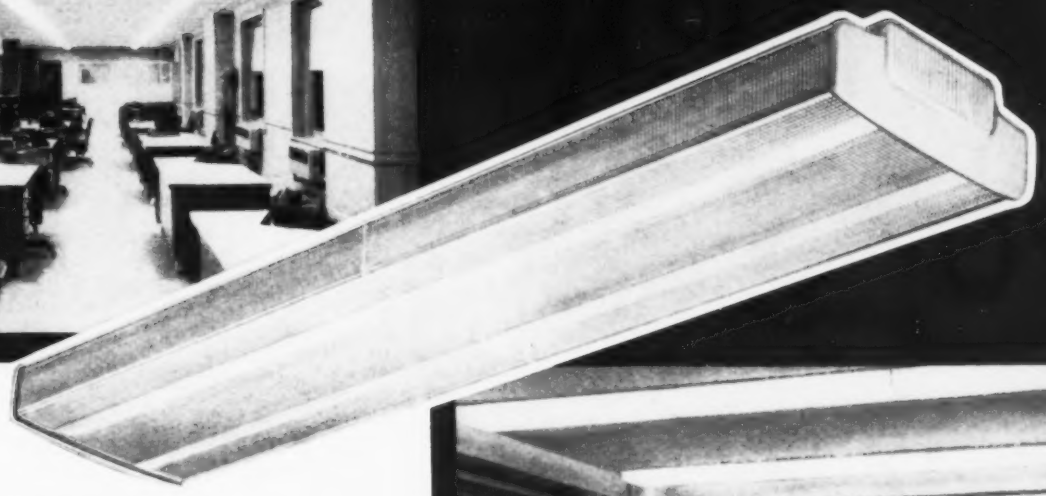
QUALITY MOTOR CONTROL

RETAIL STORE

Every Installation Proves the Lighting Quality of

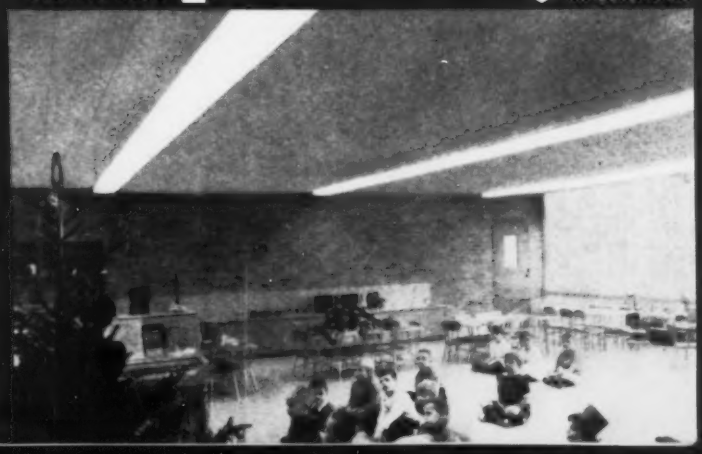
HOLOPHANE REALITE®

OFFICE



DRAFTING ROOM

KINDERGARTEN



Featuring PRISMALUME®
(crystal acrylic plastic)

Maximum Light Control...
High Output...Low Brightness

Those who know lighting quality, have been unanimous in their acclaim of REALITE... Wherever it has been used—offices, stores, drafting rooms, schools, banks, showrooms—it has provided consistently effective results: high level illumination with the utmost visual comfort...The PRISMALUME enclosure is light in weight, shatter resistant, free from discoloration. Its prismatic control directs maximum lighting to the area where it is most needed...In terms of "life cost" per installation, REALITE® assures considerable economies.

Our engineering staff invites inquiry regarding your lighting projects...

Holophane

HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898
342 Madison Ave., New York 17, N.Y.
THE HOLOPHANE CO., LTD., 416 KIPLING AVE. SO., TORONTO 18, ONT.

MOLONEY

DISTRIBUTION TRANSFORMERS OFFER

LOWER LOSSES

LOWER EXCITING CURRENT

LOWER IMPEDANCE

IMPROVED REGULATION

BECAUSE . . .

CORE

COIL

Redesign of the entire line of Moloney Distribution Transformers has brought about significant improvements in the mechanical design and in the electrical performance.

Inside . . . and outside . . . Moloney Distribution Transformers are designed and built for long, efficient, and economical operation. Specify Moloney Transformers . . . All Along The Line.

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

MOLONEY ELECTRIC

MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

For phone number of closest representative see advertising index in back of book.

All your kitchen appliances will be clean, cool electric appliances in a Medallion Home

An all-electric kitchen is just one of the advantages you'll find in a home bearing the Medallion Home award

Every Medallion Home guarantees you:

1. **An all-electric kitchen,** with major electric appliances such as a modern range and oven . . . all part of the basic home plan and price.

2. **Full Housepower wiring for present, and future needs** to handle the appliances you own today *plus* those you'll want tomorrow.

3. **Provisions for proper lighting** in all areas where it's needed to insure your family's safety and comfort.

And, for the ultimate in luxury living, there's the **all-electric** home—the Gold Medallion Home with a modern electric heating system such as the amazing electric heat pump that both heats *and* cools.

Always remember . . . look for the Medallion award before you buy *any* new home.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

Tremendous National Fall Promotion On

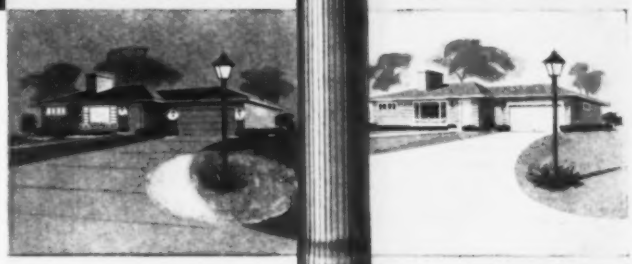
MOE Light®

"ELECTRIC EYE"

POST and LANTERNS

M-844/M-923 (Left)
"Light Command" Post & Lantern Combination. Lantern 9½" square, 19¼" high. Black on Solid Aluminum with Solid Brass Trim.
Regular Dealer Price.... $27.94
Special Dealer Price $23.97

MOE LIGHT "Light Command" turns ON at sundown... OFF at sunrise!



SPECIAL PROMOTION PRICES

Here's a terrific new attraction for all your customers — priced to move fast. Sensational "Light Command" post has photoelectric control unit that turns lantern on/off automatically. Not affected by other light sources. Ideal for home driveways, patios; hotel, motel, camp, resort, estate grounds.

NATIONALLY ADVERTISED

Big color ads in the "big influence" magazines, October and November issues, will reach 11,300,000 readers.

HOUSE BEAUTIFUL HOUSE & GARDEN
LIVING FOR YOUNG HOMEMAKERS

FREE COLOR POSTERS

Big wall or window posters, featuring post-lantern combination with SPECIAL INTRODUCTORY PRICE, will help you sell.

M-853/M-923 (Left)
"Light Command" Post & Lantern Combination. Lantern 11½" high, 20" shade. Black on Solid Aluminum with Solid Brass Trim.
Regular Dealer Price..... $29.94
Special Dealer Price $26.97

M-923 (Right)
"Light Command" Post ONLY. Adjustable from 72" to 84". Pre-wired, grounded, UL approved convenience outlet meets all local codes. Black on Solid Aluminum. Patent Applied For.
Regular Dealer Price..... $16.77
Special Dealer Price $15.57

SPECIAL INTRODUCTORY PRICES UNTIL NOVEMBER 30, 1959 ONLY.

Announcing a Sensational New MOE Light OUTDOOR LINE.

HIGH STYLE, HIGH QUALITY, HIGH PROFIT!

Colorful new catalog folder now available.

SEND TODAY FOR FULL DETAILS

THOMAS INDUSTRIES INC.
LIGHTING FIXTURE DIVISION
410 S. Third St., Louisville 2, Ky.

MOE Light®
MOE LIGHT · STAR LIGHT · BENJAMIN
ENCHANTE · SAN MARINO

THOMAS INDUSTRIES INC., Lighting Fixture Division
410 S. Third Street, Louisville 2, Ky., Dept. EW-9

☐ Rush full details on your special Post & Lantern promotion.
☐ Send catalog folder on new high style Outdoor Fixture line.

Company.....
Address.....
City..... Zone..... State.....
Your Name.....

Visit our Booths 51-52 at the NECA Convention, Fontainebleau Hotel, Miami Beach, November 9-12

EVERY PERSON HAVING RESPONSIBILITY FOR SPECIFYING SCHOOL LIGHTING SHOULD HAVE THIS BOOK

FREE!*

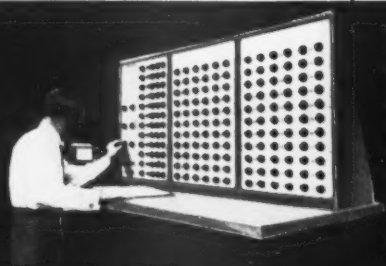
The A-B-*See* of Modern School Lighting

24 pages of vital information involved in classroom lighting and lighting other school areas. Explains how much light students require for easiest study. Illustrates with photos and text the effects of glare and brightness. Gives recommended reflectance values for proper seeing conditions within classrooms.

* PRICE TO GENERAL PUBLIC $1.00

A comparison chart of different types of lighting fixtures is included in the Classroom Lighting section. Many types of fixtures commonly used for areas other than classrooms such as libraries, labs, shops, auditoriums, gyms, are illustrated and recommendations for use given at the end of Section Two.

Write for your copy today.



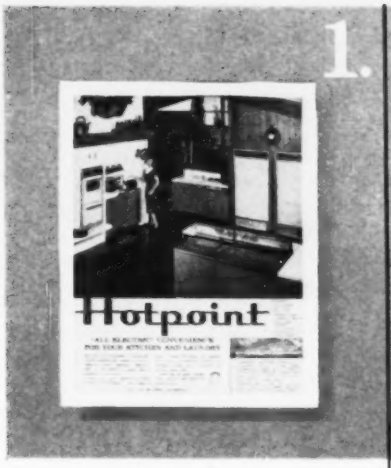
Many problems discussed in this book were solved by Smoot-Holman's advance design analogue computer. This new computer, the only one of its type ever built for commercial use, solves problems of fixture design, as well as many other problems in the field of lighting.

SMOOT-HOLMAN COMPANY · *Inglewood · California*

For phone number of closest representative see advertising index in back of book.

ONLY HOTPOINT

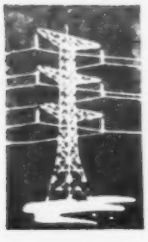
BACKS THE BIG MILLION-DOLLAR MEDALLION HOME LIFE SPECTACULAR IN THESE 3 IMPORTANT WAYS



HOTPOINT FULL-COLOR ALL-ELECTRIC KITCHEN AD in the Medallion Home section of the September 14th issue of LIFE magazine.

HOTPOINT MERIT AWARD provides advertising and display material, kitchen planning, plus other special merchandising support to builders who include Hotpoint electric kitchens in their Medallion Home models.

HOTPOINT HONOR HOME PROGRAM awards 2 Isetta cars to builders who do the best job of merchandising Hotpoint electric kitchens in their model homes.



LOOK FOR THAT Hotpoint DIFFERENCE

A Division of General Electric Company, Chicago 44, Illinois

For phone number of closest representative see advertising index in back of book.

"By installing BERMICO CONDUIT at breakneck speed, we kept project work moving on schedule"

WILLIAM McCABE, Vice-President
Lord Electric Co., Portland, Oregon

Under construction, Lloyd Center, Portland, Oregon, one of the nation's largest metropolitan business-shopping developments, costing an estimated $30,000,000. 20,000 KVA initial power requirement.

"PRIME CONTRACTS for the Lloyd Center were let four months before the electrical contract," pointed out Mr. McCabe, Vice-President and Manager of the Portland office of Lord Electric Co. "By the time we were awarded our contract — the site was ready for the electrical conduit, so we had to move fast.

"Fortunate for us, Bermico was specified. By installing Bermico Conduit at breakneck speed, we kept project work moving on schedule."

Bermico Conduit is a great boon to electrical engineers, contractors and utilities. It is lightweight, easy to handle, simple to cut and assemble. Each 8-foot length is precision engineered, with smooth inside bore to allow easy pull-through without abrasion. Bermico is made from cellulose fibre, impregnated with coal tar pitch. It is extremely resistant to acids, alkalies, heat, water and corrosion — and of high dielectric strength. Use Bermico on *your* next job.

Distributed by WESTINGHOUSE Electric Supply Company and Agent Jobbers. Offices in Principal Cities.

Another quality product of

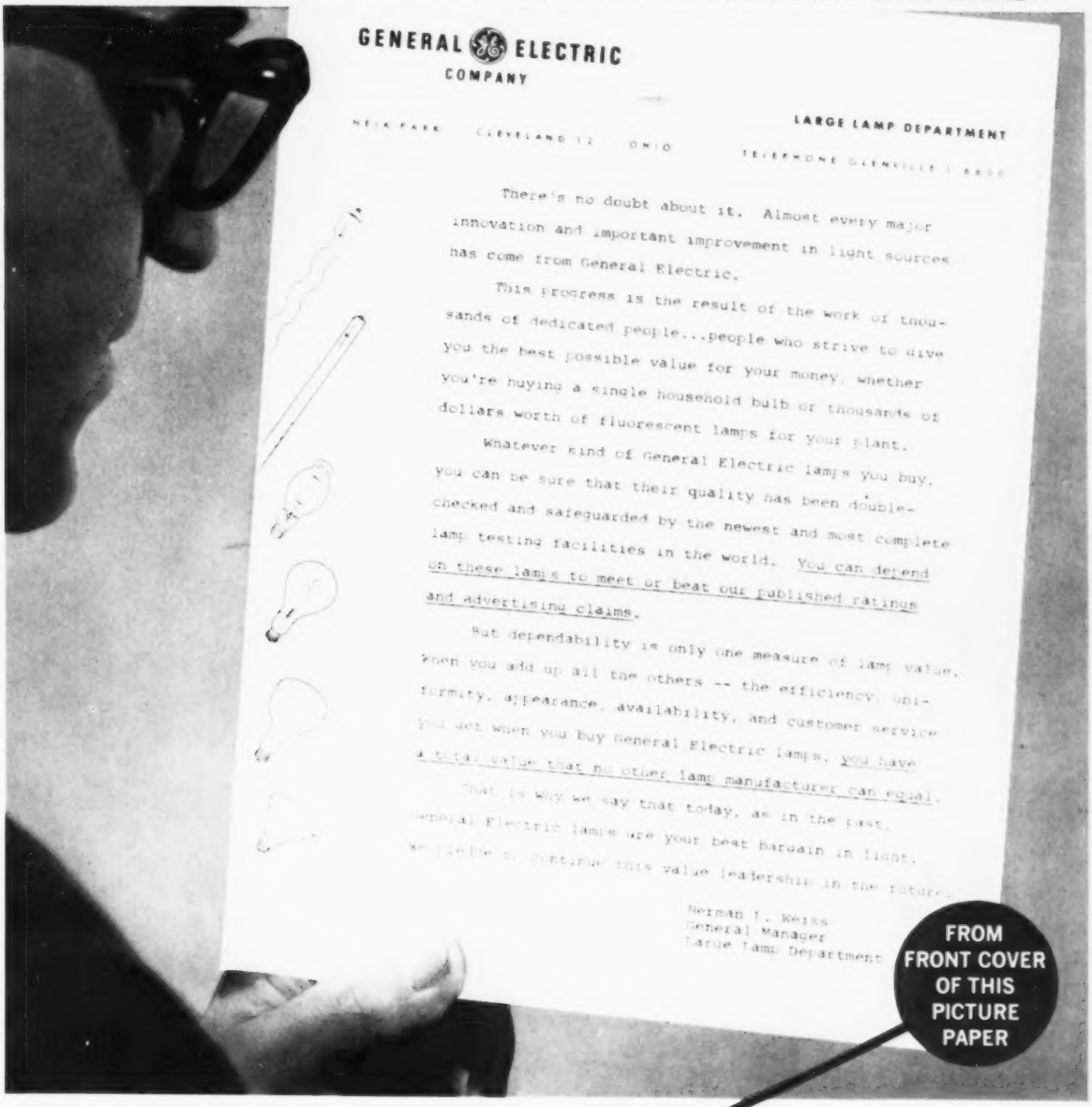
BROWN QUALITY COMPANY

681 Market Street, San Francisco, California

For phone number of closest representative see advertising index in back of book.

"GENERAL ELECTRIC LAMPS ARE YOUR BEST BARGAIN IN LIGHT"

A STATEMENT OF IMPORTANCE TO YOU AND ALL YOUR LAMP CUSTOMERS:


GENERAL ELECTRIC COMPANY
LARGE LAMP DEPARTMENT
There's no doubt about it. Almost every major innovation and important improvement in light sources has come from General Electric.
This progress is the result of the work of thousands of dedicated people...people who strive to give you the best possible value for your money, whether you're buying a single household bulb or thousands of dollars worth of fluorescent lamps for your plant.
Whatever kind of General Electric lamps you buy, you can be sure that their quality has been double-checked and safeguarded by the newest and most complete lamp testing facilities in the world. You can depend on these lamps to meet or beat our published ratings and advertising claims.
But dependability is only one measure of lamp value. When you add up all the others -- the efficiency, uniformity, appearance, availability, and customer service you get when you buy General Electric lamps, you have a total value that no other lamp manufacturer can equal.
That is why we say that today, as in the past, General Electric lamps are your best bargain in light.
We pledge to continue this value leadership in the future.
Herman F. Weiss
General Manager
Large Lamp Department
FROM FRONT COVER OF THIS PICTURE PAPER

FREE FROM G.E. Interesting new, data-packed, informative 20-page picture paper, loaded with tips on lowering your customer's cost of light with improved lamps, maintenance, lighting layout. Helps you help him pick the most economical, efficient General Electric Lamps for each specific application. Mail coupon today, or call your G-E Large Lamp Distributor.

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric Co., Large Lamp Dept. C-932
Nela Park, Cleveland 12, Ohio

PLEASE SEND ME THE "FACTS OF LIGHT"

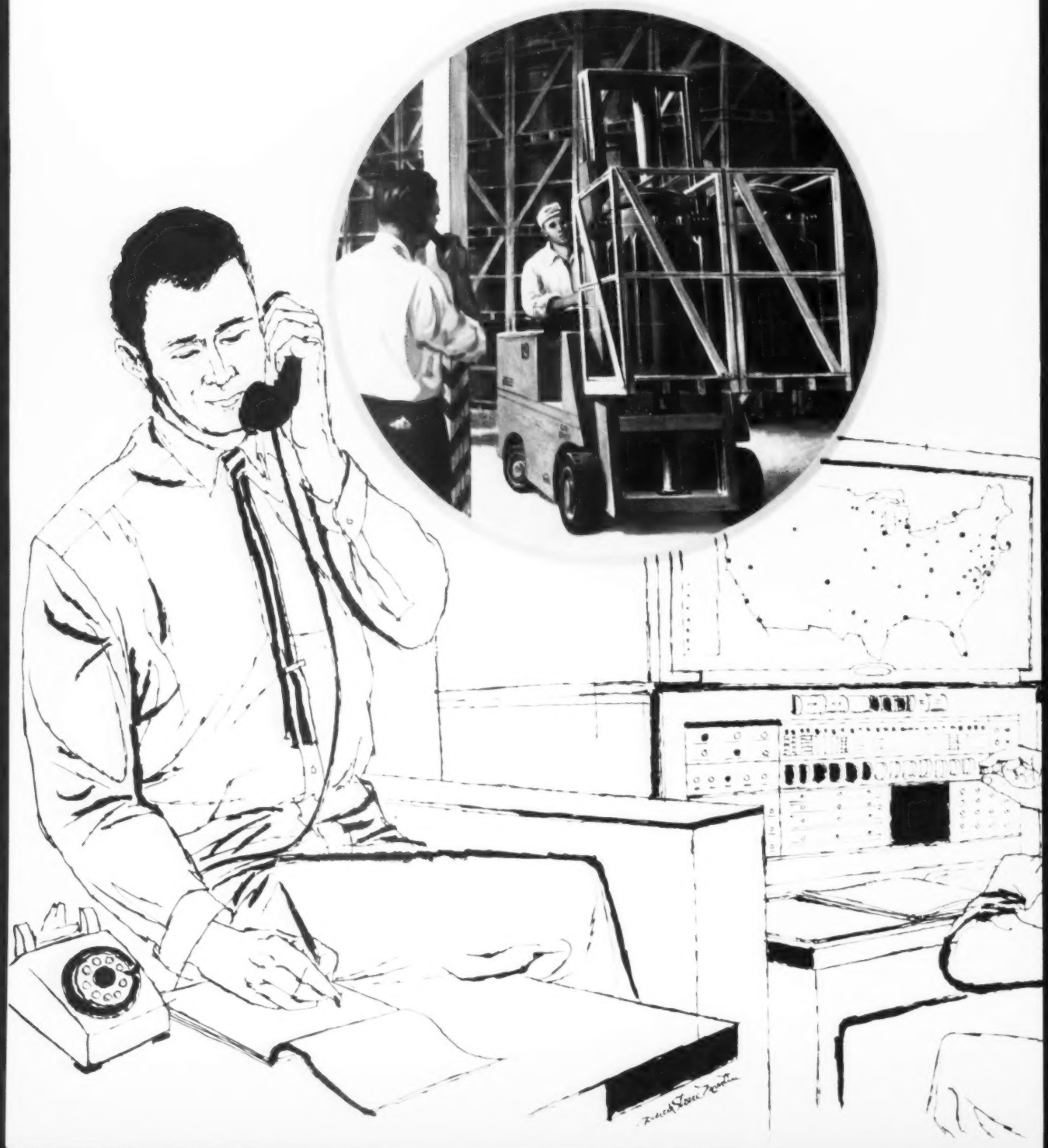
Name _____

Company _____

Address _____

City _____ *Zone* ____ *State* _____

Before you buy another



transformer... CHECK SERVICE

General Electric ships in 24 hours within the U.S.A. ...also rebuilds, repairs, and uprates

You cut distribution transformer inventories when you take advantage of G.E.'s fast delivery. No need to keep dollars on your shelves or to spend needlessly on warehouse handling and storage. General Electric has more than one hundred district warehouses, backs them up with extensive factory stocks, and offers you 24-hour shipment when needed.

Overnight shipment is only part of General Electric service. Service Shops—48 of them—put emergency repair service within convenient geographic range; these facilities prove their worth especially in times of flood, fire, and storm. Other service includes repair and uprating of your old transformers as well as technical advice on product or system problems.

Before you buy another distribution transformer, check service—give your transformer manufacturer credit for the extra values he gives you. General Electric Company, Schenectady 5, New York.

431-79

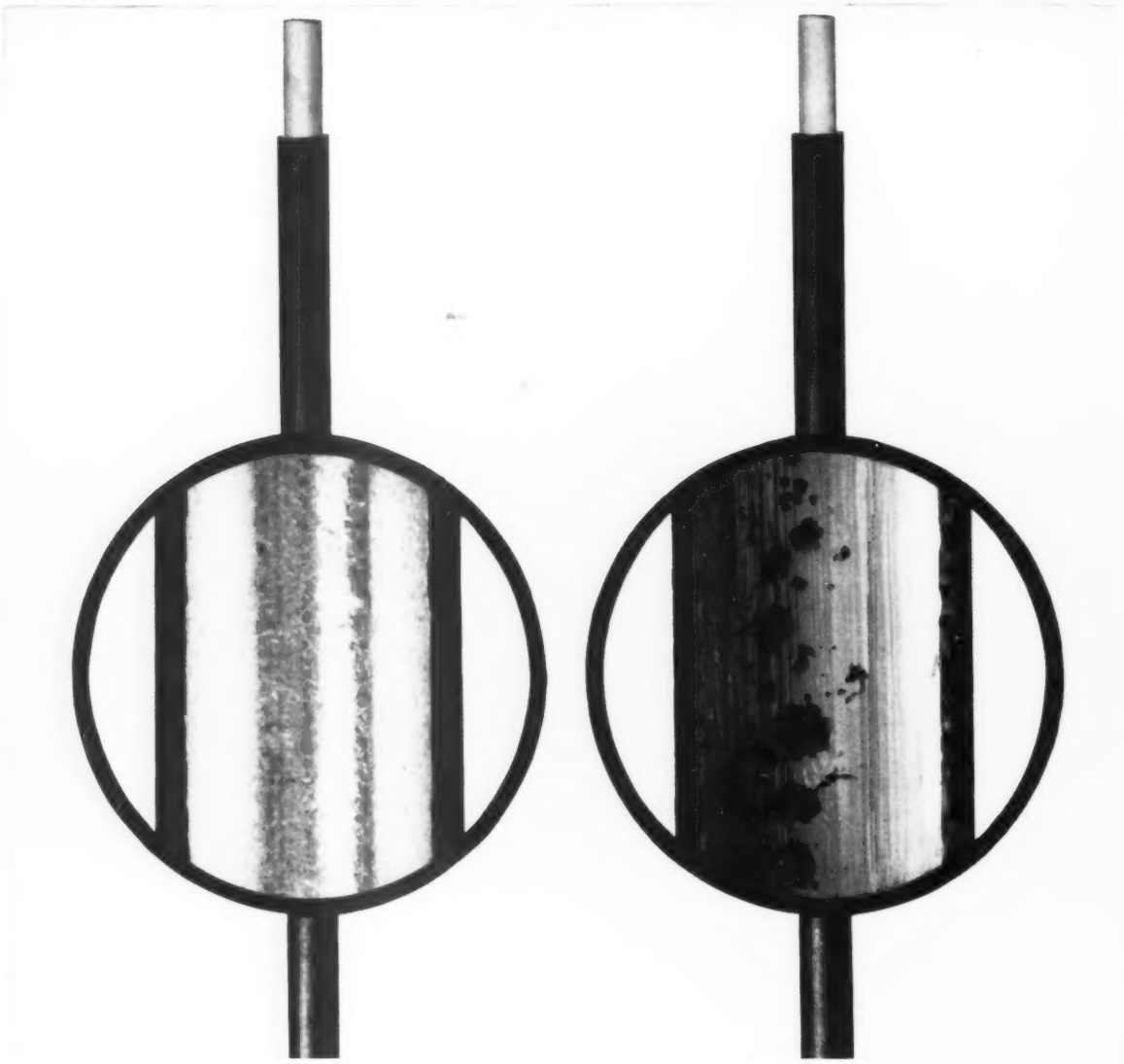
Progress Is Our Most Important Product

GENERAL ELECTRIC

GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU

		G.E.	OTHER MFRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.



QUALITY CONTROL MAKES THE DIFFERENCE IN ALCOA COVERED CONDUCTOR

Most covered conductor looks about the same . . . and, for the first few years, *may* perform about the same. But looks can often be deceiving and sometimes very costly. For the fact is: all covered conductor is not alike. There's very often a big difference . . . and, in Alcoa covered conductor, that big difference is quality control.

Take the problem of dirty wire, for example, shown in the illustration of polyethylene covering above. Though a small amount of grease, dirt and mill pickup on bare conductor may not be detrimental, such is not the case with covered conductor. In covered conductor, if the wire is not absolutely clean and free from grease and foreign particles, voids, pinholes and air pockets may result when the covering is applied. This causes uneven covering, creates points of weakness which often lead to shortened life. But you never have to worry about this problem with Alcoa covered conductor . . . continuous quality control prevents these hidden weaknesses by eliminating their causes.

Alcoa covered conductor undergoes the most exhaustive series of tests in the industry . . . tests before, during and after manufacture to make sure you receive the very best product which can be made by the most modern production methods.

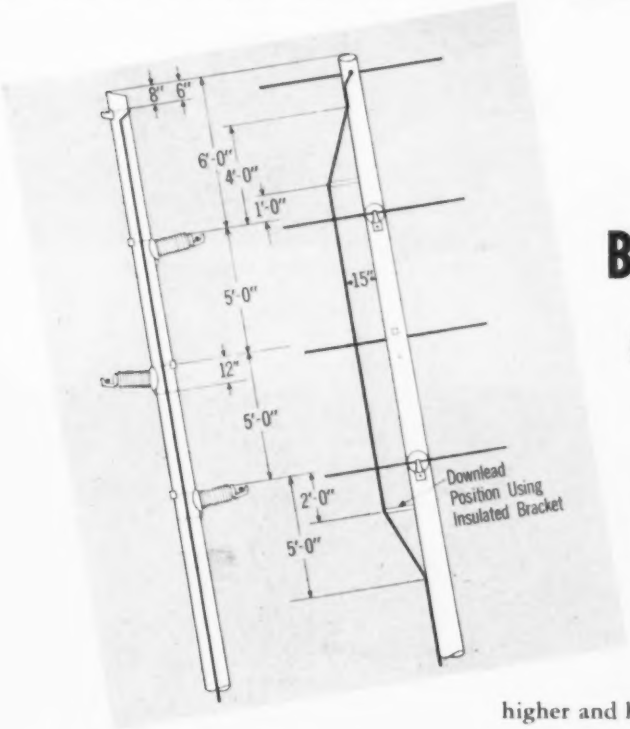
Recognize this big difference of quality control in your installations by specifying Alcoa . . . in neoprene, polyethylene or special coverings. No extra cost, but savings through added reliability and longer life are bound to be substantial. Aluminum Company of America, 2112-J Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

ALCOA ALUMINUM

IMPORTANT COST REDUCTION IN TRANSMISSION LINE CONSTRUCTION



Build this 69 kv transmission line with only 7 bolts per structure

Here is a line design that reduces the labor component of construction cost. Good news for builders that find labor factors higher and higher!

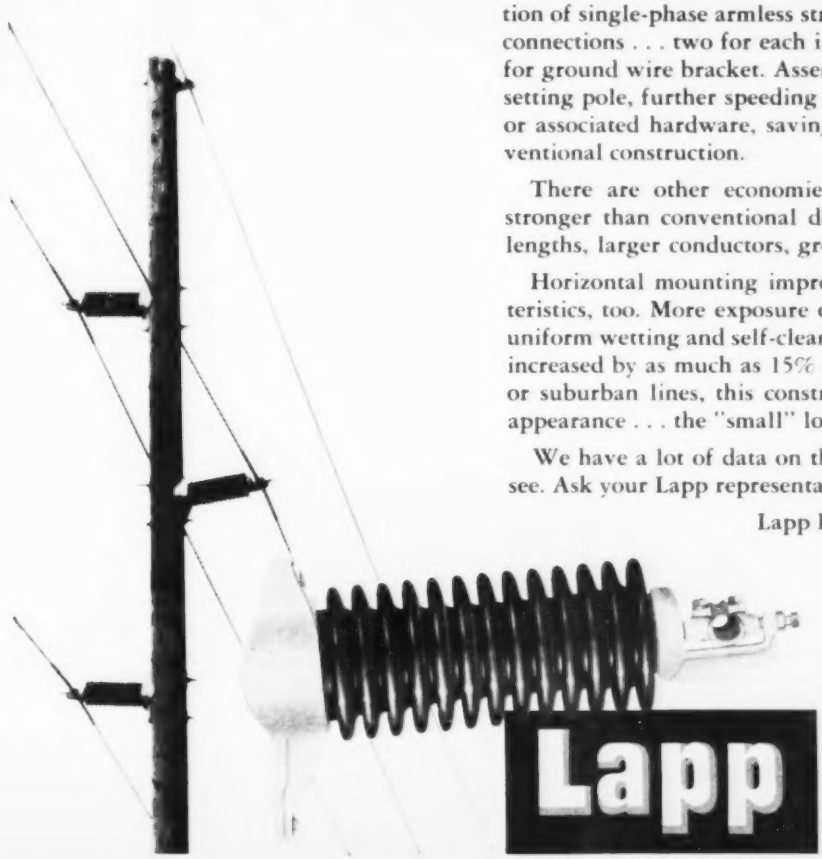
Use of horizontally-mounted Lapp Line Posts permits erection of single-phase armless structures, with only seven bolted connections . . . two for each integral-gain-base insulator, one for ground wire bracket. Assembly is done before raising and setting pole, further speeding erection. Without arms, braces, or associated hardware, savings are an actual 25% over conventional construction.

There are other economies also. Armless structures are stronger than conventional designs, permitting greater span lengths, larger conductors, greater factors of safety.

Horizontal mounting improves insulator electrical characteristics, too. More exposure of insulator surfaces encourages uniform wetting and self-cleaning . . . wet flashover values are increased by as much as 15% over upright ratings. For urban or suburban lines, this construction offers trim, unobtrusive appearance . . . the "small" look of a distribution line.

We have a lot of data on this construction that you should see. Ask your Lapp representative or write:

Lapp Insulator Co., Inc., Le Roy, N. Y.



WESTERN REPRESENTATIVES:

Los Angeles: Earl S. Condon Co.
San Francisco: Donald E. Ingalls
Seattle: Charles F. James
Butte: R. E. McDonough Co.
Salt Lake City: Riter Engineering Co.

LIGHTING ADVANCES FROM

BEN

forerunners of wonderful things to come

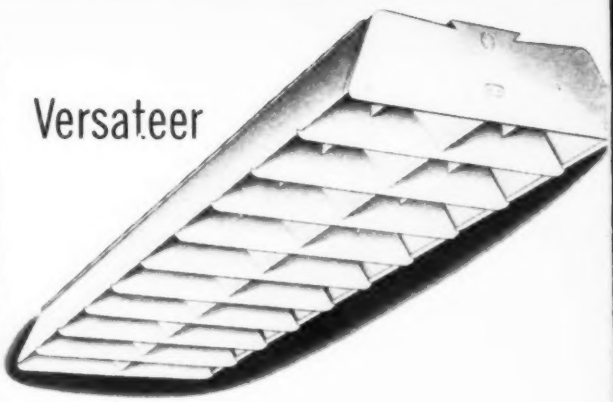
4 PROFIT MAKING REASONS WHY IT WILL

Catalina

FASTEST SELLING COMMERCIAL FIXTURE IN ITS PRICE RANGE!

The Catalina is available with Benjamin's own 45° plastic louver or the exclusive new L-120 lens. Now *architects* have new freedom of design ...*contractors* like the minimum installation time required for the simple two-piece construction... *consulting engineers* find a new ease of wiring and fixture layout. This plus modern design makes the Catalina today's most popular lighting fixture!

Versateer



A NEW FIXTURE FOR THE SCHOOL AND OFFICE LIGHTING MARKET!

Designed to give you more features and lighting qualities than any similar unit on the market today. Available with popular 35° x 25° or 45° x 45° shielding in two or four lamp arrangement. Simplified butt mounting arrangement affords rigid, continuous row installation and assures perfect alignment of fixtures. Dollar for dollar, the Versateer has no equal.

JAMIN

Keep your eye on Benjamin. A dynamic new force has been added to the company that has led the lighting industry in product development since the days of the wireless cluster.

Now, Benjamin Electric has joined forces with Thomas Industries, combining a Benjamin tradition of quality with outstanding Thomas merchandising facilities.

This strong combination gives you a positive pledge of new products and promotion—a promise of new horizons for all in the business of lighting.

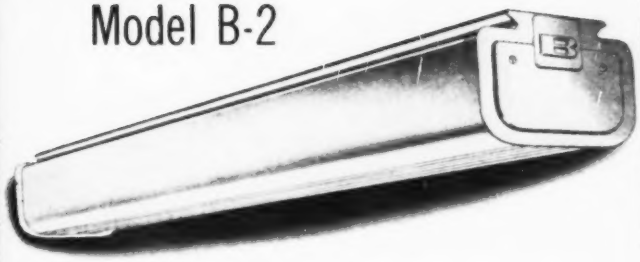
Your local Benjamin representative will be happy to help you. Contact him on any problem ...large or small.

BENJAMIN ELECTRIC MANUFACTURING CO., Des Plaines, Illinois
SUBSIDIARY OF THOMAS INDUSTRIES INC.
BENJAMIN • MOE LIGHT • STAR LIGHT • ENCHANTE • SAN MARINO

These products are sold only through qualified Benjamin wholesalers

PAY YOU TO KEEP AN EYE ON BENJAMIN!

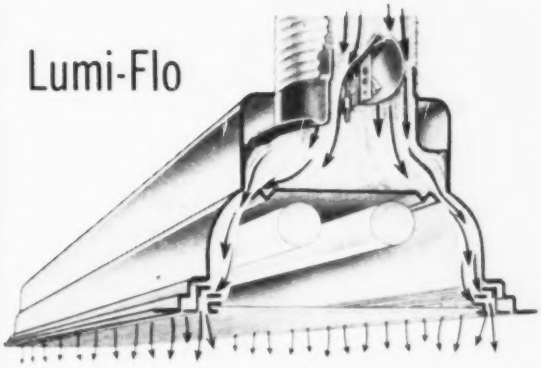
Model B-2



NEW "B" SERIES
COMMERCIAL FLUORESCENTS

Unit packed simplicity is the keynote for this new line of plastic enclosed fixtures. Designed for low cost store and office lighting in the two-lamp version and for high quality corridor lighting in the single lamp type. The polystyrene plastic cover snaps into the channel offering a rigid, trouble-free installation that makes lamp replacement and cleaning easy.

Lumi-Flo



WORLD'S FIRST AIR CONDITIONING
LIGHTING FIXTURE COMBINATION!

Truly the most versatile fixture ever created. Benjamin research and pioneering has made available this tested and approved Trofferlite that delivers quality lighting, draft-free air conditioning and *now* wintertime heating. The triple-duty Lumi-Flo offers installation short cuts and cost cutting maintenance features never before possible.

For phone number of closest representative see advertising index in back of book.

...until you figure on this underfloor duct! Here are four of the many reasons contractors have installed underfloor duct by Orangeburg in thousands of the nation's finest buildings: (1) It is light, easy to handle and to cut. (2) Its installed cost is exceptionally low. (3) Non-metallic, it lasts indefinitely. Corrosive action of cinder fill or concrete will not affect it. (4) It keeps a building "electrically modern" for its lifetime. New outlets can be tapped in easily and economically anywhere along duct line. Get the complete story before you figure your next job. Write Dept. WE-99 for Catalog 202.

ORANGEBURG MANUFACTURING CO. • Orangeburg, New York • Newark, California
A Division of The Flintkote Company, Manufacturers of America's Broadest Line of Building Products

ORANGEBURG®
Underfloor Duct System

For phone number of closest representative see advertising index in back of book.

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. VOL. 123 NO. 3 SEPTEMBER 1959

Control desk made especially to operate all equipment during the sinking of the sections of tunnel. (Author at the desk.)

Light for B. C. Under-River Tunnel

Karl Hazelsteiner, Section Engineer, Foundation of Canada Engineering Corp. Ltd. Christiani & Nielsen

Queen Elizabeth II officially opened and thus put into operation on July 15, 1959, the Deas Island tunnel, making the second major crossing of the Fraser River, once mighty barrier between Vancouver, B. C., and the lower mainland and the U. S. border. The four-lane, 2,-200-ft vehicular tunnel can handle a capacity of 7,000 cars per hour, as against the 3,000 on Patullo Bridge, and should provide adequacy for some time to come.

The problem of animating this giant and providing for all the services required was laid in the hands of "Fenco," the Foundation of Canada Engineering Corp. Ltd. A wide variety of complex technical problems were encountered. Light was one of the major ones. Others included power supply, ventilation, fire protection, pumping, control of traffic.

While lighting a tunnel by night is not difficult, the lighting during daytime provides complexities usually not encountered in other installations. Psychological and physiological factors, the different response to light stimuli, make tunnel lighting a difficult undertaking. Not much previous experience can be adopted, as every tunnel has different requirements mainly because of location, density of traffic and type of supervision. The main problem is the clear sunny day, when an abundance of light is available outside the tunnel. To provide for a smooth transition and still provide an economical solution is the designers biggest task. Accommodation and adaptation of the human eye are involved. Each new level of illumination requires it. Although it only takes seconds to adapt the eye to the new level, we have to make every effort to shorten this time if we wish to maintain speedy and safe travel. Never should the driver be "blindfolded," not for a fraction of a second.

With normal eyes the adaptation from a high level to a lower one takes place in two steps. The eye is capable of expanding from 2 to 5 mm in about two seconds, and then continues to expand further, slowly to the limit of 8 mm. Contraction of the retina, however, from any value, on sudden exposure to a brighter light – as when leaving the tunnel–takes about one second only.

This behavior of the human eye is the starting point for the designer. The bright outside daylight in this project is followed by artificial shadow areas by means of louvres, which are followed by very

Approaches lighted with fluorescent street lighting units in pairs on center standards

intensive artificial illumination inside the tunnel proper. Then the level of illumination decreases, in our case from over 100 f-c to 10. Two-thirds of the tunnel is adequately lighted with this amount. The exit provides no difficulty and only the artificial shadow areas and little illumination is necessary.

The problem of adaptation and accommodation solved, the amount of light required to provide adequate visibility had to be tackled. Four mutually interdependent and interrelated parameters attribute to visibility, viz: time, size, brightness and contrast. Size and time are outside the engineer's control, and even contrast is a factor largely uncontrollable. Poor eyes, dashboard reflection, windshield dust, shiny hood, bright vehicles ahead, haze and veiling glare change the contrast factor. With all these imponderables it seems to make little difference whether the tunnel is painted or tiled, with resultant need for constant care. Even the contribution to higher brightness of paint or tiles or both is questionable, as it is a generally accepted fact that a 2:1 difference in brightness is required to produce a significant visible effect.

Lighting Levels

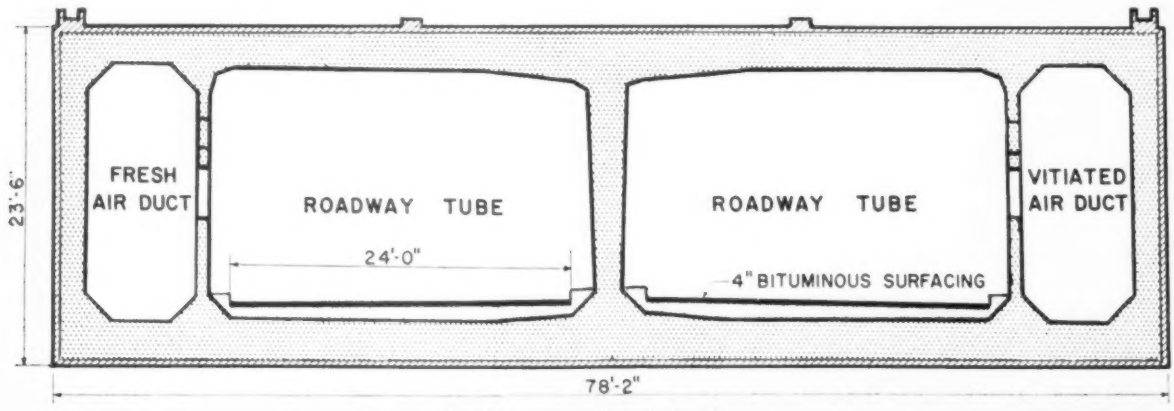
The level of illumination considered adequate has been steadily increasing, and the third edition of the IES Lighting Handbook gives ample proof that adequate illumination exists only in time and not in space. While in 1914 the Stockton Street Tunnel, San Francisco, was adequately illuminated with 0.2 f-c, the year 1937 asked for more than twice as much for the illumination of the Broadway Low Level Tunnel in Oakland. In 1950 good illumination was 10 f-c, in 1953 the San Francisco Broadway Tunnel asked for 20 f-c, and then for a while 35 f-c was considered a safe, adequate value. Well, the Deas Island Tunnel provides for 130 f-c at the entrance and should set the pace for tunnels to come. Because of the eye's ingenious capability to adapt, only at the entrance is such high illumination required. The lighting level tapers off quickly and 10 f-c for the rest of the tunnel provides very comfortable seeing conditions.

Of course automatic change of the level of illumination is provided. Whenever the outside illumination decreases, the inside illumination follows, controlled by photosensitive cells. During the night 10 f-c is the general level, and for very little traffic further reductions to 5 f-c may be made by selection of governing photocells or time clock arrangements.

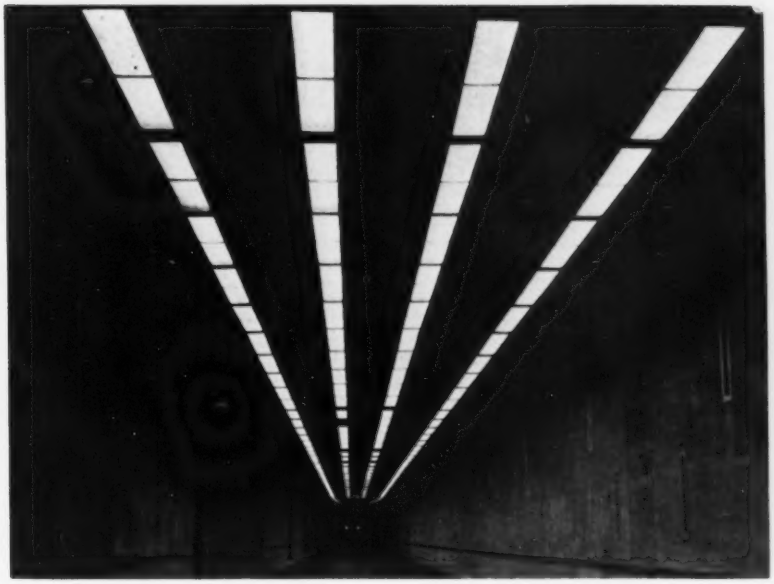
Choice of Light Sources

Since the development of the discharge lamp the choice of light sources, giving the maximum amount of lumen per watt, was restricted to two types: the mercury vapor and the fluorescent lamp. The mercury vapor, even the color-corrected type was ruled out for several reasons such as dimensions, high brightness concentrations and—last not least—because it was felt that by choosing fluorescent lamps, in particular the higher loaded ones, they may be upgraded to even higher lumen per watt in years to come.

It was the desire of the client—the Tunnel was built for the British Columbia Toll Highways and Bridges Authority—to use as many local products as possible and fortunately enough a known manufacturer of lighting fixtures undertook the manufacturing of the special



Typical cross-section of tunnel



Four rows of enclosed fluorescent units, ballasts alongside. Louvers make artificial shadow areas at exits and entrances

tunnel fixtures. These had to be pressure watertight. In size they should not exceed 6 in. in height, as the tunnel clearance is strictly limited. So 430-ma, 8-ft-long slimline and 800-ma rapidstarts were chosen.

The Tun-O-Lite units, over 700 are installed, represent the major single investment in the electrical and mechanical installation. Together with the Freeman Hi-Liter, at the entrances the 440-v lighting system provides for approximately 8,800,000 total lumen output at a price of 2.5¢ per lumen installed.

Overhead Louvers

The transition from outside high daylight levels to inside tunnel illumination is made possible on an economical basis by providing artificial shadow areas. For 300 ft outside the tunnel entrance, aluminum louvers are placed on concrete beams horizontally, so as to provide no access for direct sun rays. The slanting of the horizontal members of the braced structure is such as to provide a smooth but efficient transition, never exceeding the ratio 1:10 in brightness. These all-important louvers are made of anodized aluminum and the different angles of tilt are calculated that under no condition in any season will direct sunlight reach the roadway underneath. The louvers do not obstruct any air movement; to the contrary, the reflective surface provides for a cooler area underneath, so inducing draft, which is very welcome to add to the artificial ventilation. This draft eliminates the accumulation of dust particles at the portal, which would give an uncontrolled amount of veiling luminance.

At the exit the louvers extend only for 180 ft, still ample time for the readaptation of the eye to outside illumination levels.

Electrical and Mechanical

Since this tunnel was designed to perform automatically under all foreseeable conditions, suitable detecting and operation controls had to be combined to allow the safe and rapid passage of vehicular traffic. The tunnel capacity being 7,000 cars per hour, the importance of proper functioning of the ventilating equipment can be understood. Although the power requirements proper are not too high—about 1,000 kva under optimum conditions—the problem of having power available at any moment for vital services had to be carefully studied.

It was decided to have two main power supply sources, one line from the north and the other from the south side, besides a diesel emergency generator set. Should power fail on one side, an automatic transfer to the other side takes place. As a precautionary measure, the diesel unit is started immediately by automatic means, ready to take over after 10 to 15 seconds. Should the power get lost again, this diesel unit is capable of handling the vital services in the tunnel until power on one or the other side is restored.

Between the transient stage of switching, be it the line power from one side to the other or the starting up of the diesel, a motor-generator set, constantly running under no load conditions, fed from a 300 amp/hr storage battery, takes over a portion of the lighting circuits, so that under no condition, not even for a fraction of a second, can a total blackout take place in the tunnel. The transfer is so rapid—in the order of milliseconds—that it will be hardly noticeable by the eye.

Ventilation

Ventilation is the most important single feature in a vehicular tunnel. Four 75-hp fan motors provide the necessary torque to drive 10 ft diameter fan blades. The four fans are capable at full speed of handling 1,000,000 cfm of air. A semitransversal ventilating system is supplied and the fans, as virtually all controls, are located in the ventilation buildings at the entrance and exit of the tunnel. Two fans are capable of handling their half of the tunnel but, by opening a damper, located at the midriver point in the tunnel airduct, one fan can take over the ventilation requirements for the entire half.

This ventilation system is controlled automatically by a time clock, where the existing traffic pattern information is stored, and by an array of other control devices, which start or stop the fans, initiate full or half speed, direct forward or reversed flow. Although manual over-

Lighting units behind concrete beams shield eyes. Louvers were installed later

ride is provided, an elaborate system of overlapping controls enables automatic operation.

Sensing devices relay all information as to density of traffic, content of carbon monoxide, smoke, fire or water conditions, the removal of a fire hose or fire extinguisher, as well as the use of the conveniently located emergency telephones, to one central place, the main control room, located in the north ventilation building. Here an entire wall shows pictorially the condition of the tunnel. Each traffic light is duplicated, the state of the fan and the behavior of the ventilation system are easily interpreted by control lights and alarm panel. Counters and recorders give a permanent record of all events of importance.

Should, for instance, the carbon monoxide content in the tunnel reach a predetermined level, a controlling light comes on, indicating where this irregularity takes place. Simultaneously the fan has started up or, if running, will be set to high speed to cope with the situation. The same would happen if diesel fumes veiled the light in the tube.

The Deas Island Tunnel is unique on the North American continent. There has never before been built a tunnel with a rectangular cross section. Never before has the sand-jetting method been used to provide a uniform bed for the tunnel elements in a trench, made by suction dredges. The only predecessor is the tunnel at Rotterdam, but new features have been incorporated and the latest knowledge in electrical and mechanical as well as structural design has been used.

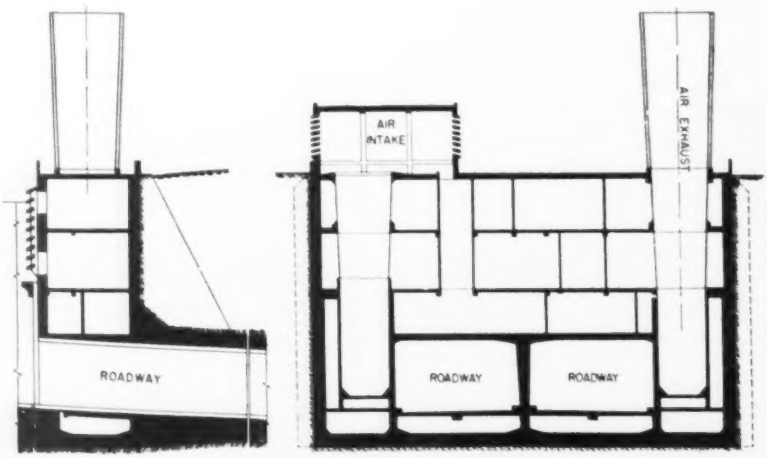
The sinking of the six tunnel elements represented the major feature of the construction. The huge concrete troughs, each 20,000 tons of mass, had to be floated in position and controlled in their movements with an accuracy of one-eighth of an inch. The changing salinity of the river, the velocity of the current in both directions and the time element combined made electrical control of the entire sinking procedure a necessity.

Foundation of Canada Engineering Corp. Ltd. designed a unique control desk, which allowed the supervision of the entire procedure from one control point. Not less than 64 different controls and gages connected with more than 20 miles of cables to their limit switches, solenoid valves, pressure switches, current and voltage supervising devices and stress indicators gave immediate indication over the status of the system.

Elaborate warning and alarm systems excluded human failure. Not less than five overlapping communication systems were used to assure communication between the parties concerned, including divers on the bottom of the river, ships upstream and downstream, crews on the shore and even aircraft and helicopters. From simple telephones to radar screens, every modern piece of equipment was represented, and it paid off. The sinking of the six tunnel elements was done as scheduled and the accuracy of the positions was assured. The tunnel proper is 2,200 ft long and lies up to 85 ft below the Fraser River. The entire structure including approaches is almost one mile long. Clearance, even at low water, allows the passage of the biggest ocean-going vessel.

Conclusion

Designing a tunnel is not a routine job. It requires careful study and consideration of many different aspects. With the long life expectancy of a structure of this kind, the engineer assumes an amount of responsibility not usually encountered. In anticipating not only future needs but future trends of developments, the designer must find a solution, which is economical today and not obsolete in the future. He really designs the world of tomorrow with the tools of today, bridging the gap to the unknown future with an unusual amount of imagination and almost prophetic foresight.



Layout of ventilation buildings

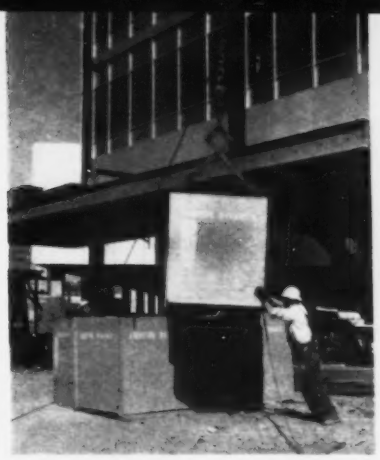
Packaged Units

speed Kaiser Center lighting installation

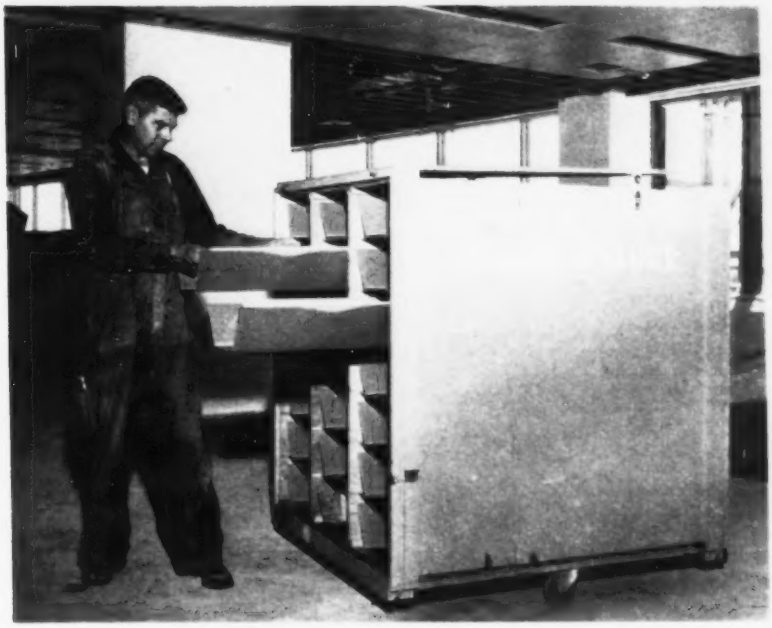
Installation of 16,000 lighting fixtures in the 28 floors of the new Kaiser Center building in Oakland by Foothill Electric Co. is done as if it were but an extension of the factory production line. As scheduled by Larry Hultgren, superintendent, especially made plywood pigeonholed cases, each containing 21 two-lamp, recessed 4½-ft fixtures and 277-v ballasts, are loaded on a big truck and trailer at the factory in Whittier by Lighting Dynamics. With them are removable four-wheel dollies to fit the bottom of each case.

On arrival, both are lifted from the truck by the building cranes and delivered to the floor designated on the tag tacked to the case. Dolly affixed, each case is rolled to the area where prescribed. There two electricians install them—one removing the fixtures from the case and handing them to the other on a movable scaffold, who inserts them in the space left for them between the aluminum perforated acoustical sections. They fit between the water pipes of the heating or cooling system. Already wired lengths of flexible conduit, with No. 12 or 14 aluminum wire, await them and connections are quickly made. Such organization speeds up the installation at the high labor cost end of the production line.

Plywood cases and dollies come by truck

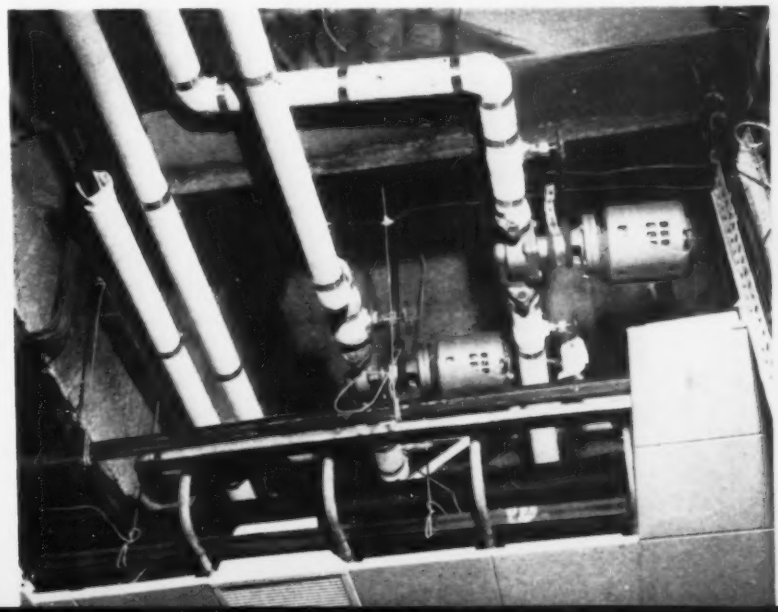


. . . are lifted by crane to floor ordered



Case of 21 fixtures, each protected in a pigeonhole, rolled to area designated on tag at upper corner, on four wheel dolly puts them right where they are handy for . . .

. . . electricians to take out and mount in the ceiling and connect to ready circuit



Fixtures fit between heating or cooling pipes below water circulating pumps shown

New IES lighting levels and their effect on . . .

Office Building Electrical Design

Walter G. Bayha
Bayha, Weir & Finato Inc.
Mechanical and Electrical Engineers
San Francisco

After listening to all the talk about the new higher levels of lighting being recommended by the Illuminating Engineering Society, one would get the impression that levels now in general use had been doubled or tripled, with values running to several thousand foot-candles.

Actually, the new recommendations are very much in line with the best of present-day lighting now installed in offices and shops. They are the result of eight years of research, under the auspices of the IES by Dr. H. Richard Blackwell, director of the Vision Research Laboratories, University of Michigan, and the careful evaluation of his findings and setting up of the new Recommended Foot-Candle Tables by the IES committee of recommendations of quality and quantity of illumination. They represent the latest knowledge of what is required for good seeing and will be accepted because they meet the real needs of seeing in all fields of human activity.

These values are not radical. They represent the levels being used in many modern offices and shops.

For instance, the new recommended levels for offices run from 30 f-c for conference rooms to 70-100 f-c for normal office work. Only special tasks such as accounting and drafting go to the 150-200 f-c level.

In industry, machine shop levels run 50 f-c for rough work, 100 f-c for medium work, with special supplementary lighting up to 500 f-c for fine inspection.

These higher levels have already been installed by many firms because they have found that high lighting levels pay off in increased productivity, fewer mistakes, reduced accident rate and better working morale.

This does not mean that providing 100 f-c to 150 f-c in an office or shop can be done without careful selection of lighting fixtures and thoughtful concern for the over-all effect. Extra ventilation or air conditioning is often required because of the added heat from the lighting fixtures. Lighter finishes on walls, ceilings and floors become a necessity as lighting levels go up. With the greater number or increased size of lighting fixtures involved, the architect must have greater concern with incorporating the lighting into the room's over-all esthetic appearance.

As these higher lighting levels become more prevalent, new designs combining acoustic control, air conditioning and lighting in one integrated ceiling will be developed to an even greater extent.

In order to get a perspective on how lighting levels of around 100 f-c affect the design of electrical systems for buildings, the total magnitude of the electrical load for the building must be considered.

The electrical load of a typical office building consists of:

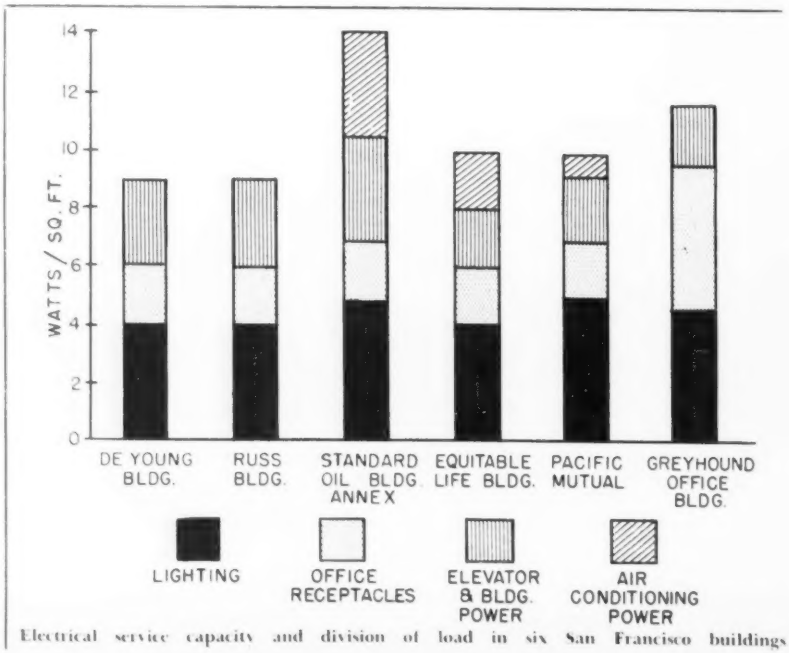
	Watts/Sq Ft Low	Average	High
Receptacles for business machines, electric typewriters, etc.	2.0	2.5	3.0
Building power for elevators, pumps, fans, etc.	2.0	3.0	4.0
Air conditioning systems		3.0	4.0
Lighting	2.5 (50 f-c)	4.0 (75 f-c)	5.0 (100 f-c)

The chart in Fig. 1 shows the electrical service capacity and division of load for six typical multi-story office buildings in San Francisco, which have been built or remodeled during the past six years. The general lighting level in these buildings is around 50 f-c, however, there is sufficient capacity to permit levels of 75-100 f-c in general and 150-200 f-c in critical areas without adding new electrical capacity.

Thus, installing lighting to meet the new foot-candle recommendations would not cause any drastic redesign of the electrical system in buildings that have been designed in accordance with good engineering practice, since the increased load due to the higher foot-candle levels is responsible for only 15% of the total electrical load in the building. Of course, this would not be true of older buildings, many of which have a service capacity of around two to three watts per square foot, or less.

In general, when a service is designed for a new or remodeled building, a figure of around 12 w/sq ft would not be excessive in view of the rapid advancements in the use of electrically driven office equipment and the greater use of air conditioning.

As new, more efficient lamps are developed, the higher lighting levels may be obtained with less increase in load demand on the building service. New fixtures utilizing high-output lamps in properly shielded and ventilated housings will come along to mark a new step forward in the progress of good seeing.



Electrical service capacity and division of load in six San Francisco buildings

Modules for movable partitions, where air is drawn around fixtures to cool them, at the new Crown Zellerbach Building, San Francisco

Shining Examples From the West

Engineers designing modern structures are well aware of growing electrical demands and provide capacity to meet the new IES recommended standards, as Walter Bayha has indicated in the buildings named for which his staff has made studies and designs. In the new Crown Zellerbach Building in San Francisco Skidmore, Owings & Merrill has done so by integrating the lighting and air conditioning systems, using the fixtures both to supply and exhaust the air and so absorb ballast heat. Lighting levels are 80 f-c maintained. Below: Manufacturers of lamps contribute by improving lamp efficiency. Seattle's new Logan Building offices thus provide 120 and 260 f-c

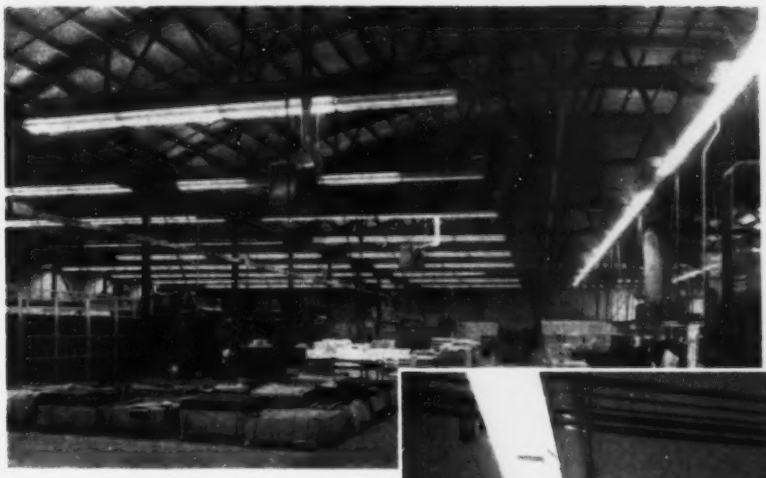
First use of G-E's new Premium 3, 40-w fluorescent 3,500-lumen lamps in Day-Brite Mobilex fixtures. They can also be used as replacements in rapid-start or preheat systems. Logan Building was engineered by Mandeville & Burge and Emery Roth. Installation was by Anderson Electric, Bellevue

Electrical West—Vol. 123, No. 3

On the Streets . . .

Western cities are adopting the higher recommended standards now made practical by higher output mercury and fluorescent street lighting lamps and equipment designed to distribute the flux where it is needed, on the road below rather than wasted into the air

Sacramento (above) tried modernizing its downtown street lighting with Power Groove fluorescent fixtures mounted on davit-type aluminum standards that arch the light out to cover the 52-ft-wide street and increased pavement illumination to 1.9 f-c, six to 12 times more than previous. Joe F. Yee, engineer (above), designed the system. Collins Electric Co. made the installation. Now it plans a more extensive modernization program. (Right) Portland's S. W. Third Avenue was the last of that city's $10 million modernization program, begun in 1954 and totaling more than 11,000 mercury units. The program was laid out by Carl Lundell, city utilities engineer, on a priority system based on traffic density and need, and installed by Portland General Electric on a consistent change-over program yearly. In Victoria (below) the merchants along the 700 block of Yates Street agreed to pay the difference in monthly cost for improvement of the 400-w mercury to 1,000-w color-corrected mercury, increasing from 1.5 f-c to 3.5 f-c lighting levels. A. Stickney Harris of B. C. Electric promoted the successful experiment with the approval of Victoria City



Fast-paced modern industry requires fast seeing ability to speed production, avoid errors, cut down rejects, improve safety and employee efficiency and morale. So it welcomes more light as the prime aid to quick seeing. To prove this, Westinghouse at its new lighting fixture plant at San Lorenzo practices what it preaches, with its own upward-component industrial high-output lamp units (at left). Below: Eitel-McCullough plant at San Carlos with upward component, two-lamp, 800-ma units has levels of 120 to 130 f-c in production areas of critical seeing to make tubes

. . . or on the

Production Line

With trolley duct for support and supply, the All-Brite fixtures designed for shelf lighting in the parts center at Convair Astronautics in San Diego can be moved as required. Levels of 30 f-c on shelves are obtained where fixtures are placed but movability permits economy in total units

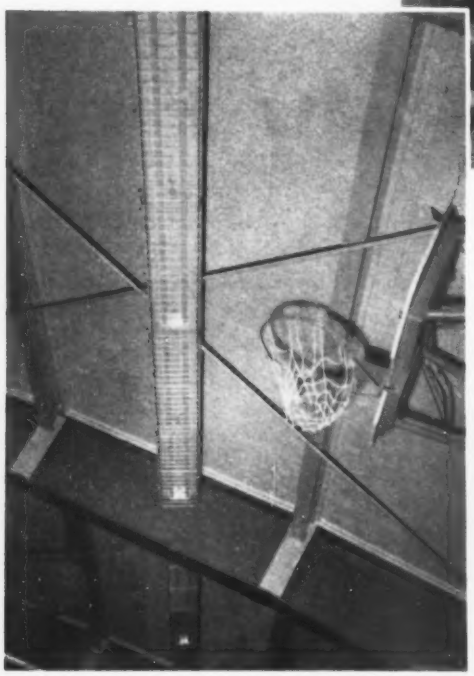
Both daylight and fluorescent are integrated by means of photoelectric control at the Hewlett-Packard Co. plant in Palo Alto. When daylight through sawtooth roof windows drops below 100 f-c, one or both rows of fixtures are switched on or off as required

Electrical West—Vol. 123, No. 3

...for Schools and their Sports

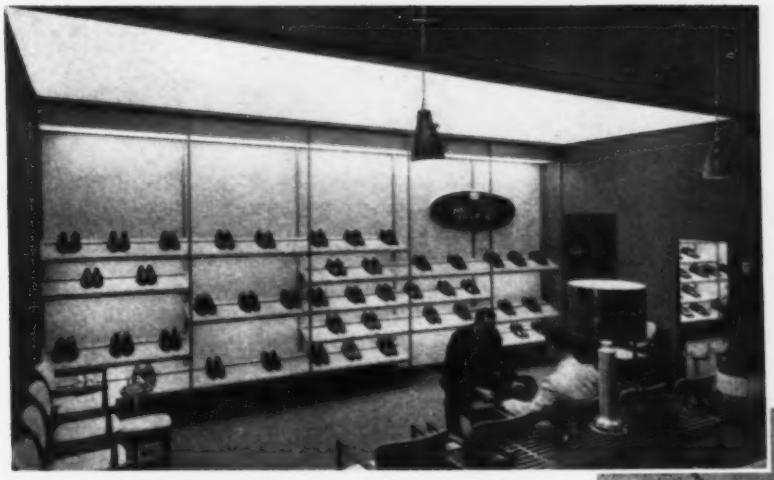
Both in study and in play areas, schools endeavor to provide a better seeing environment, combining higher levels with brightness and contrast control. The library at East High in Salt Lake City (left) does so with Smoot-Holman "Perfect Vision" units operating at 800 ma to give 90 f-c of well-controlled illumination. Ballasts are remotely placed to reduce noise

Illustrating a modern concept in teaching—around a table instead of desks—even greater care in control of brightnesses is needed. For such high levels reduce contrasts if the source is well shielded and distributed as at right in the Fontana school district where Foster Sampson engineered the luminous environment. Indirect Sunbeam Sightline 800-ma fixtures provide high levels but with brightnesses well controlled. The installation was made by Copperbar Electric Co. of Baldwin Park. Architect was Herman I. Ruhnau of Riverside, Calif.



Special locked guards permit Smoot-Holman industrial unit use in Hayward gym

With 238 high-bay incandescent units in rings, any combination may be switched for sports or shows at Montana State College Center in Bozeman, even for 100 f-c levels. Alex G. Drapes was the engineer who designed lighting



and to Enhance Merchandise

High accent is given the shoe display at Arthur Frank Clothing in Salt Lake City, where light from the luminous ceiling is boosted to from 200 to 320 f-c on the shelves by concealing fluorescent strips back of each tilted shelf, a total of 14

A 15-year-old lighting installation in the Nampa, Idaho, Department Store was replaced by Cook Electric Co. with 91 Sunbeam four-lamp and 31 eight-foot Shallorama units to triple the illumination and increase sales five per cent after the installation.

Using cool white de luxe lamps in a luminous ceiling, and additional bull's-eyes and spots for accent, color characteristics of the furs were enhanced at Graf's Furs in San Diego by T. B. Murphy, Hackett Acoustics & Specialties, designer, and Federal Electric

Fowler's women's apparel store, with several levels, in Cheyenne; designed by Fred H. Rosenquist, Public Service Co. of Colorado

. . . and where

Lighting

Pioneer bank in Salt Lake City, Walker Bank & Trust Co., modernized the lighting of its offices and banking area. With a luminous ceiling installed by Wasatch Electric, it has 105 f-c over counters and 135 f-c over the customer center area

Tower Building in Seattle has gone through several stages of modernization during its life. Original lighting was with enclosing bowl incandescents. Then (below) as its occupancy was that of a loft building for small manufacturing, it was converted to industrial type of two-lamp fluorescent fixtures. This was later replaced as it became more of an office site to flush-mounted panels of diffusing glass in a lowered ceiling. Latest change by Selo Electric Co. was to Day-Brite Area-Liters, which fit into the spaces formerly occupied by the built-in fixtures. The completely enclosed fixtures reduce maintenance and increase light. They also permit changing of partitions to suit new occupancies

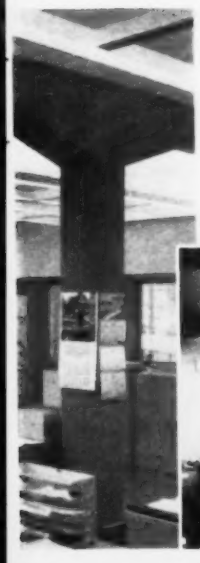
California Fruit Exchange in Sacramento had 20 offices relighted with Smoot-Holman Perfect Vision fixtures with 800-ma lamps, raising the levels from 5 to 15 f-c to from 70 to 120 f-c. Wismer & Becker made the installation from plans engineered by Sacramento Municipal Utility District lighting department. In the sales office at right, 25 two-lamp fixtures were installed to derive 110 f-c. The walls, ceiling, floor and office furniture had good reflectance factors

there is

Modernization

Lobby of California Fruit Exchange in Sacramento (below) relied on a desk lamp to aid the one fixture. As remodeled, at right, six fixtures with $1_2 \times 1_2 \times 1_2$ louvers between fixtures to give the louverall effect was novel treatment. Result: 75 f-c

Guaranty Bank & Trust Co. in Denver modernized its customer area as shown at right, replacing an old skylight with Guth Gratelite, back of which was mounted a grid of fluorescent strips, by Reliable Electric Co. to designs by Harold Rankin and Jack Kitson of Public Service Co. of Colorado. Around the room perimeter are recessed troffers with similar Gratelite plastic translucent cubicle diffusers to illuminate such areas



Modern in its day but outmoded now was the previous lighting in the California Fruit Exchange sales office. It had only 15 f-c of light from its 10 4-ft, 2-lamp fixtures mounted here and there. Note also the only "air conditioning" was from a ceiling fan shown below right

Promoting office lighting modernization, Jack Cottingham of Portland General Electric talks to business men's groups and illustrates the need for engineered better seeing with a portable miniature office and lamp kits. Walls, ceiling and fixtures can be changed to visualize actual circumstances. The same portable was used successfully in demonstrating school lighting modernization

Above: Committee members—J. D. Whitnell, Arizona Public Service; Rolly Alexander, Industrial Electric; Larry Roeser, Arizona Public Service; David M. Walkington, New State Electric; Jerome M. Kelleher, general manager, Arizona EJIB

Arizona campaign points way to

Brighten Sales With Light

"Sell in a State of Light" was given several significant meanings in that state of light—Arizona—this summer. Despite strikes in the construction industry, the electrical industry went to town in the sale of new or renewed lighting installations. By the end of the seventh week of the three-month commercial and industrial sales campaign by the Electrical Joint Industry Board of Arizona and the Arizona Public Service Co., more than 40% of the quota of 3,860 kw of new lighting had been sold and, as August ended, the impetus promised to take the campaign well over the top.

As the third campaign upon which Arizona Public Service and the Electrical Joint Industry Board have collaborated successfully, the selling relationship between the utility, contractors and union has grown more profitable to all. It was planned jointly and executed with complete cooperation. What is more, the contractor-union joint board had its members out selling. Furthermore, the board ran ads and sent out brochures of its own, in addition to those by Arizona Public Service. EJIB also set up "Planned Lighting Service" with the utility to which telephone or written responses to the advertising were directed.

Because it is difficult for contractors to get to meetings in the day or evening, they were asked to come to a 7 to 8 a.m. breakfast. A guide for organizing such contractor breakfasts was prepared in advance and the division, area and sales managers of each division were schooled in making a quick presentation of the program. The quota in kilowatts for each district represented at the breakfast was translated into what it would mean in equipment sales and labor available to the contractors there.

"What does this all mean to you as an electrical contractor?" they were asked. "Well, our estimates, which we have obtained from some of our contractor friends, indicate that, for every kilowatt of load that we add to our lines in the form of lighting jobs, it takes at least $250 worth of labor and equipment for the customer. Now some electrical contractor must sell and install this equipment. That means dollars in your pockets."

Contractors were told of the help that the utility's commercial lighting

Mailing pieces like the one at left urged businessmen to check their lighting. On opposite page is one section of road map

It's easy to spot "inadequate lighting"
If your store is dark enough to doze in — it's too dark for business. Adequate lighting, properly planned, means healthier sales charts, happier management.
Send for the "Man with the Meter"
ALL he does is point the meter – and it registers the exact number of foot-candles of light concentration in any area of your store, shop or office. It's a scientific way of determining how good or how bad lighting conditions are – and what steps to take. Discover how modern lighting can brighten your sales – make a date with the "man with the meter" soon.
It Pays to LIVE... WORK... SELL... in a state of LIGHT!
ELECTRICAL JOINT INDUSTRY BOARD
Any qualified electrical contractor can provide you with a survey of your present lighting, with no obligation. Or phone Planned Lighting Service
ALpine 3-940

salesmen would give—first by calling on all commercial and industrial customers and then, if requested, by following up and assisting the contractor to sell the job. The participation of the EJIB in the advertising was also told. Contractors were asked to talk to their customers and friends, to use the slogans, "Sell in a State of Light" to store customers and "Lighting Does Not Cost—It Pays!" to others.

The campaign, with the highest quota the company sales staff was ever given, was launched at a big sales meeting in Phoenix on June 5. A contest was set up for salesmen, with expense-paid trips to scenic resorts in "the state of light," Arizona, as prizes. The meeting itself was designed to coach them on the latest developments in lighting and equipment.

The meeting was presided over by Al Williamson and Jerry D. Whitnell, and included among its speakers and instructors, Don Willis, vice-president, L. L. Roeser, Jack Wetmore and W. P. Reilly of Arizona Public Service; Walter Haspedis, Columbia Electric & Mfg. Co., Spokane; Vic Nelson, General Electric Supply Co., Phoenix; F. B. Wood, Westinghouse Electric Corp., Phoenix; and H. A. Ciesicki, General Electric Co., Phoenix.

Colorful advertising and publicity was built around the "Sell in a State of Light" theme, "to make Arizona a state of light for expanding business, greater industry, growing profits, more efficiency, better protection and emphatic business identification."

One of the mailing pieces was similar to a road map opening up to a map spread of the "state of light."

A poster, made to look like an aged parchment treasure map showed the location of supposed buried or hidden treasures for which the state has been famed in legend.

The mailing pieces of the EJIB were more of the typical selling brochures with a strong sales appeal and pictures to contrast old with new and better lighting. Identification with the campaign was made by a small map of the state behind a drawing of an electrician and the Joint Industry Board's logotype.

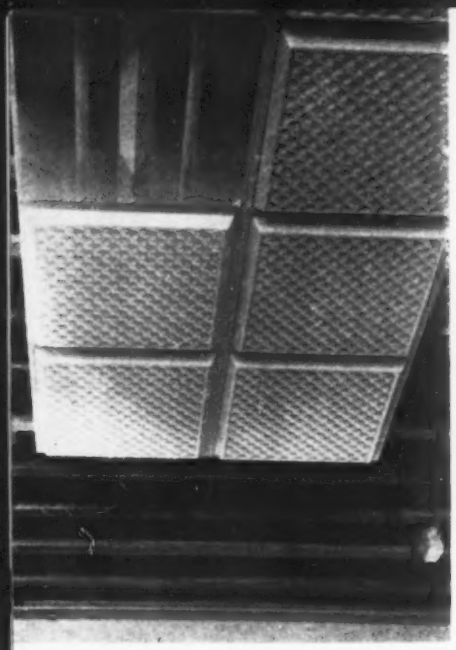
Markets aimed at in the campaign were customers who would profit most by increased lighting levels, such as neighborhood stores, supermarkets, bowling arenas, nighttime shopping areas, industrial plants, modernization of offices and parking areas, floodlighting, garden lighting, show windows, hotels and restaurants.

Contractor leaders have been enthusiastic over the joint selling campaign. David M. Walkington, New State Electric Co., president of the Electrical Joint Industry Board and chairman of its public relations committee, said: "Each year the sales campaigns have produced more business for electrical contractors throughout the state. We are extremely happy to join with Public Service in promoting lighting of all kinds."

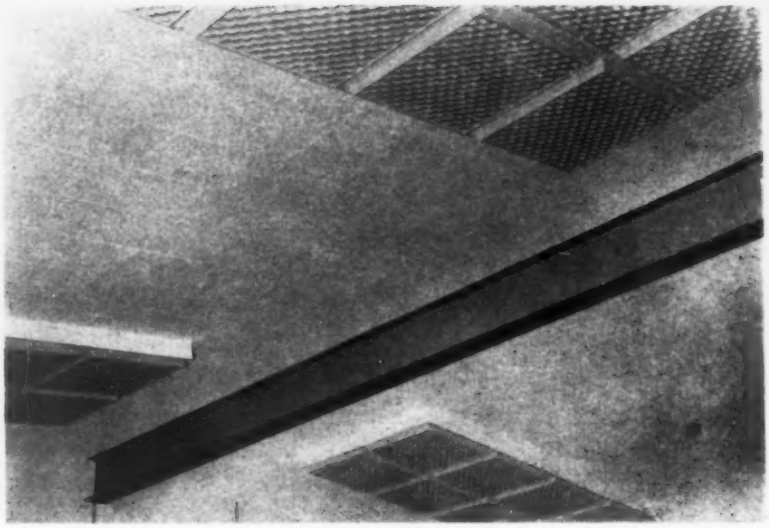
Jerome M. Kelleher, general manager, EJIB, declares: "It is our opinion that cooperative advertising produces more results by far than any efforts of our organizations individually could achieve independently."

Rolly Alexander, Industrial Electric Co., member of the public relations committee: "We think that the entire concept of 'Sell in a State of Light' is excellent. The advertising program this year has been the best yet. We have received more inquiries and comments following this advertising than we have ever received before. The electrical contractors get more business each year from this campaign."

And for the utility, Jerry Whitnell adds, "I would like to say that many of us here at Public Service think it is one of the finest things that ever happened to the contractor industry in Phoenix."



Two lamps per fixture for low brightness



Four modules of two fixtures each, in typical classroom pattern, give 40 foot-candles

220-V Lighting Saves in Schools

Economy in circuit wiring offsets the extra cost of two-lamp fluorescent fixtures specified to keep the brightness levels and contrasts within the 10:1 ratio in some recent school electrical systems designed by Harold Gerber, electrical engineer, Coddington Co., San Francisco. Instead of increasing cost and complexity by using 277-v lighting Gerber, in the Del Mar School in San Jose, wired by Roy Butcher Co., simplifies things by using a 220-v system. This requires no transformation for motors, electric ranges or convenience outlet circuits. Standard switches and devices are used. The lighting, however, instead of being 115 v, is 220 v. With one circuit of two No. 12 RHW wires and one switch each classroom can be served. In order to meet code requirements great care was paid to accurate mounting of the area lighter type of flush mounting fixture on the wooden strips on the joists. Because the ballast is center mounted and against the wood, heat dissipation permits abutting the acoustical ceiling tile against the sides. With only two lamps per fixture to keep brightness low, temperature is also lower. Plastic bushings are used to protect the heavier wire and tube fittings are set-screw type to insure ground continuity.

Conduit offset to assure accurate fixture placement on acoustical mounting strips

Harold Gerber checks No. 12 RHW circuit wires from set-screw grounded switch box

Code mounting of recessed corridor ceiling unit to provide required ventilation space

ELECTRICAL WEST
Construction News

For
- -contractors
- -consulting engineers
- -lighting engineers
- -wiring designers
- -distributor salesmen
- -all interested

A package

Wage settlements in Los Angeles, San Bernardino and Riverside Counties were on a two-year basis, 25¢ per year. In Orange County the raise was 25¢ on a one-year deal. But the contractors are plagued with a new three-man foreman clause and studies are being made on foreman training, welder and cable splicer certification, apprenticeship and a guarantee for defaulted vacation pay. . . On the more constructive side, the NECA Harbor Division has wound up a successful 10-week estimating course at Long Beach's Jordan High. The accelerated course was taught 18 students by Bob Tarlton.

Mountain States Line Constructors Chapter, NECA, and District 8, IBEW, have selected Richard T. Piper of Fresno as coordinator-director of its line apprenticeship program. The area covers four states. Piper, who was rehabilitation counselor for state and federal programs in California, will headquarter at NECA offices in Salt Lake City.

Corrected date

Dec. 31, 1960, is the actual final date for receipt of proposals for revisions of the National Electrical Code for its 1962 edition, Frank Stetka of NFPA corrects us. E. E. Carlton, third vice-president, IAEI, was quoted as warning inspectors that their proposals must be in by December 1959. What he referred to was the necessary time lag for processing through IAEI sections and executive council before submittal to the code committees. . . . The 1959 code is to be off the presses in September. It is new in numbering and arrangement as well as in several changes.

Maintenance code course

Electrical Code—Theory and Application is offered as a 20-week class sponsored by the Electrical Maintenance Engineers Assn. of California at the Los Angeles Trade-Technical Junior College starting Sept. 17. Robert L. Browning, associate electrical engineer in the Electrical Plan Check for the city of Los Angeles, will teach the class.

Electrical Maintenance Engineers of the Columbia Basin has just published a 40-page roster of membership. Listing some 127 members and 85 participating companies, it attests to the growth of the organization as well as the industrial growth of the Portland area. Fred Bunnell, with McCullough & Sons, is president; John Pingel, Oregon Steel Mills, vice-president; and James Fisher of Portland General Electric Co. secretary-treasurer. About 20 electrical contractors and electric motor shops belong to the organization.

To save contracting

Beginning of a joint council of the construction industry in the Salt Lake City-Ogden area was a result of inviting representatives of principal construction groups, both labor and management, to the annual membership meeting of the Intermountain Chapter, NECA, recently. This approach is being made to protect and extend the use of contract methods of performing construction and maintenance in industrial and commercial work.

Managers organize

NECA chapter managers of Districts 6, 8 and 9 met in Sacramento Aug. 6 and 7 to discuss mutual management problems and to form an organization of their own. Host Joe Krivanek, manager of the Sacramento Valley Chapter, was selected as over-all chairman of the group and Robert Wilkinson, Inland Empire Chapter, chairman of the District 6 group, Ad Woolley, Intermountain Chapter, chairman of the District 8 group, and Ray Carey, Los Angeles Chapter, of District 9 group. Field representatives Floyd Shipp and Dex Jewett and field director, Charles Scholibo were present. It was announced that Herbert A. Hagen of Portland had resigned as field representative of District 6 and that for the time being no successor would be appointed.

What used to be the California-Nevada Conference of NECA Chapters, now known as District 9 Council, meets at San Mateo Sept. 11 and 12. Future of the legislative program is one of the major topics to be discussed.

New lamp sensation

With the "Quartzline" lamp using a new iodine cycle principle, General Electric Co. introduces a new light source of tremendous intensity in a very small package. The 500-w, 120-v lamp about the same size as a lead pencil produces 10,500 lumens, the 1,500-w, 277-v 33,000 lumens. It will be previewed at the IES national convention in San Francisco.

1962 national convention of the National Industrial Service Assn., the motor shop organization, will probably be held in San Francisco, it was announced at the Sacramento meeting of the Northern California Chapter Aug. 14 by newly re-elected chapter president, Perry Wood of Kuchel & Sievers, San Francisco. L. H. Hewelcke, North Bay Electric Co., is secretary. The choice of San Francisco was made at the recent Montreal national convention. . . . Approval was given to a resolution to motor manufacturers relative to better discounts.

Safety scripts available

Scripts for radio talks or television interviews of electrical inspectors have been prepared by the public relations committee of International Assn. of Electrical Inspectors. Members may write for a copy to use in a local broadcast. Two are available. The first is designed for Fire Prevention Week and is titled "The Electrical Inspector Speaks on the Autumn Clean-up." The second is "Death on a Kite String" for use in the early spring. Scripts have been prepared by Arthur Welklin, chief inspector, Fort Wayne, Ind.

Because some other crafts or locals got more than they did, there is a rumble among San Francisco Bay Area local unions of IBEW to welsh on their agreement and reopen for higher scales. . . Meanwhile, the steel strike was beginning to slow down some construction and the added trucking strike was affecting others.

With Kennecott Copper operations shut down by a strike Anaconda Co. in Butte was likewise hit by a suit Aug. 5 by IBEW Local 200 in Anaconda. The IBEW claims exclusive jurisdiction of the operation and maintenance of current carrying and operating equipment and claims that the company had electronic devices installed, by union members, but the maintenance work has not been given to them.

Pilot lights in switch boxes on 277-v circuits are considered to be fixtures and, being less than 8 ft from the floor, do not comply with California State Safety Orders, E. E. Carlton told the Southern California Chapter, IAEI, meeting at Santa Barbara July 22.

Puget Power solves cooling problem with a . . .

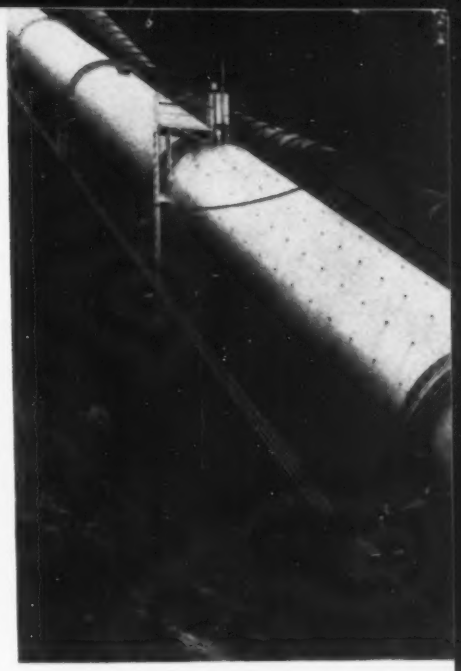
Penstock Heat Exchanger

Puget Sound's new Snoqualmie power station has gone to a closed circulating water cooling system with a penstock heat exchanger to solve the problem of clogged cooling systems that resulted from an excessive "bed load" of sand and vegetable matter.

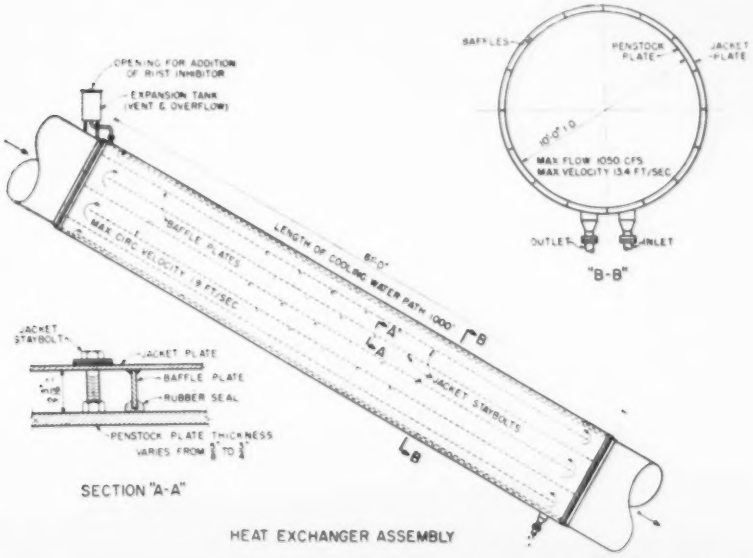
The normal method of pumping water back from the tailrace through the cooling coils would prove to be unsatisfactory even with strainers since this equipment would require an attendant at an otherwise remotely controlled station.

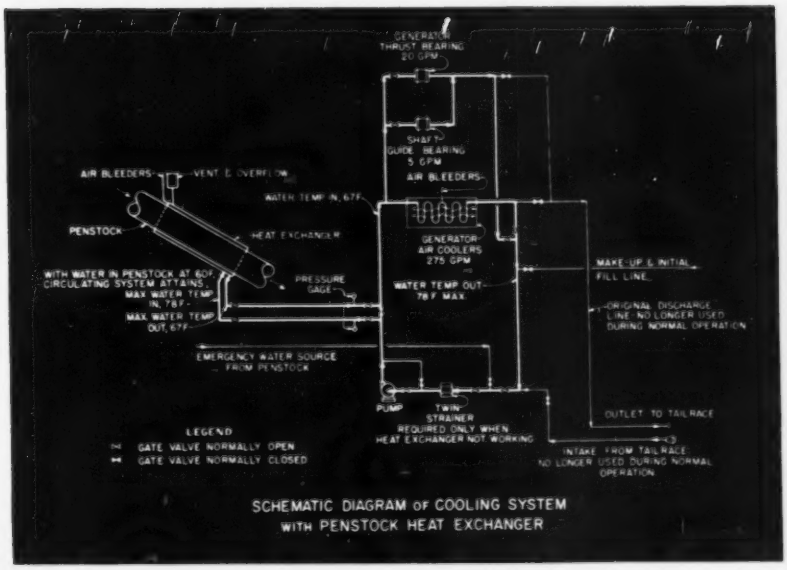
Additional studies indicated that a settling basin would not be satisfactory since the vegetable matter, leaves, chips, bark and twigs refuse to settle out.

Still another alternative, pumping clear water from an underground source, was studied but a nearby source could not be made economically available.



The completed penstock heat exchanger




GENERATOR THRUST BEARING 20 GPM
SHAFT GUIDE BEARING 5 GPM
AIR BLEEDERS
VENT & OVERFLOW
WATER TEMP IN, 67F
PENSTOCK
HEAT EXCHANGER
WITH WATER IN PENSTOCK AT 60F, CIRCULATING SYSTEM ATTAINS MAX WATER TEMP IN, 78F
MAX WATER TEMP OUT, 67F
PRESSURE GAGE
GENERATOR AIR COOLERS 275 GPM
WATER TEMP OUT 78F MAX
MAKE-UP & INITIAL FILL LINE
ORIGINAL DISCHARGE LINE-NO LONGER USED DURING NORMAL OPERATION
EMERGENCY WATER SOURCE FROM PENSTOCK
PUMP
TWIN STRAINER REQUIRED ONLY WHEN HEAT EXCHANGER NOT WORKING
OUTLET TO TAILRACE
INTAKE FROM TAILRACE NO LONGER USED DURING NORMAL OPERATION
LEGEND
GATE VALVE NORMALLY OPEN
GATE VALVE NORMALLY CLOSED

SCHEMATIC DIAGRAM OF COOLING SYSTEM WITH PENSTOCK HEAT EXCHANGER

Closed System Best

At this point the Stone & Webster engineers responsible for the project conceived a heat exchanger utilizing a 61-ft length of the 10-ft diameter penstock. The cooling system could then be a closed system free of clogging. A jacket of quarter-inch steel was built around the penstock providing a 2 3/16-in.-wide path on the outside of the penstock. A series of baffles between the penstock surface and the inside of the jacket guides the circulating water along a 1,000-ft path, during the time the heat exchange is effected. Three hundred gallons per minute of water are circulated.

In order to improve the rate of heat exchange, the outer surface of the penstock under the jacket was sandblasted to remove paint. To avoid the loss of heat exchange efficiency because of rusting an inhibitor, sodium dichromate, was added to the circulating water. The exchanger was designed to handle the full heat load of the cooling water with the generator at full load, plus pickup heat from the atmosphere and the sun. The system returns the water to the generator 7 F above the penstock water temperature which never rises above 60 F.

It works fine.

Here is PP&L's 13-year

20.8-Kv

A hot-line job showing the crossarm being attached during conversion of a vertical corner to a flat corner. The result will be greater vertical clearance for an eventual three-way corner

Pacific Power and Light Co. serves in five states, and in three of these has distribution circuits operating above 15 kv. With minor exceptions this voltage is 12/20.8-kv wye. This voltage evolved by wyeing the 12-kv delta system of a predecessor company thereby gaining considerable voltage and power transfer advantage by simply reconnecting. The areas in which these voltages are used range from the wet, Oregon coastal area—Coos Bay to Tillamook; the heavily timbered Willamette Valley—Corvallis to Springfield; in the vicinity of Lake Pend Oreille in Idaho; and in the dry, high country of Wyoming. The extent of the distribution lines at this voltage are tabulated separately.

Equipment Rating

Equipment in general use on these feeders has voltage ratings as follows: regulators are mostly of the 24-kv class, as are station OCBs and metering current transformers. Metering potential transformers are of the 15-kv class and are wyed on the circuits. Station transformers are also in the 24-kv insulation class in contrast to line transformers rated 12 kv and of 15-kv insulation level. These latter transformers are wye connected on the 20.8 circuits. NEMA class 4 and 5 pin insulators or the equivalent, depending on climatic conditions, and two six-inch discs at dead-ends are used except for direct coastal exposure, where double 10-in. smog-type suspension insulators have been used to effectively reduce crossarm burning. Lightning arresters are rated 15 kv.

Some of these circuits have been in operation for as much as 13 years, so considerable operating experience has been accumulated. We have concluded that in the main the differences between these 20.8-kv wye circuits and the parent 12-kv delta circuit is the difference between wye and delta operation, with relatively minor differences directly chargeable to the higher voltage. The characteristic of any wye circuit operation calls for more attention directed to circuit clearance from such possible grounding sources as trees, and greater attention to separation of hardware to prevent or minimize static discharges that would result in radio and television interference. One of the characteristic benefits of the wye operation is more positive and more sensitive relaying of the feeder under fault conditions.

In addition to hardware separation, hardware tightness through consistent use of lock washers and staticproof lag screws is necessary. Experimental use of 15-kv smog pin-type insulators has been made in the Coos Bay coast area. Sufficient time has not elapsed to give valid results from this trial installation.

Very little of Pacific company's operating territory is exposed to a high thunderstorm incidence, but in certain parts of Wyoming typical experience is approximately 30 per year. It has been observed that the operation of the 20.8-kv system in this high lightning incident area has resulted in no particular additional storm damage for the 20.8 over similarly exposed 12.5-kv systems.

Reduced BIL

The 15-kv-class transformers have performed exceptionally well on the 20.8-kv system with the failure rate running no higher than on the 12-kv-delta systems on which these same transformers are used. This experience corroborates the experience of other utilities. It is attributed to the multigrounding which eliminates overvoltage due to neutral shift. The higher 20.8-kv voltage has caused some radio and TV interference difficulties on transformer bushings. The solution for these difficulties has been successfully overcome through the varied use of solidly filled bushings or oil filled bushings.

operating experience with

Primary Distribution

C. L. Brown and **R. C. Martin**
Chief Distribution Engineer, Assistant Chief Distribution Engineer
Pacific Power and Light Co., Portland

Location	Years at 20 Kv	Number of Feeders	Miles of Circuit	Numbers of Customers Directly Connected*	Demand in Kw
Wyoming					
Buffalo	3				
Worland	3	3	95	270	4,270
Midwest	2				
Oregon					
Springfield	12	6	90.5	6,950	22,000
Albany	13	7	69.9	11,600	22,600
Corvallis	4	2	28.3	600	3,500
Tillamook	2	1	26.0	200	5,200
Coos Bay	13	10	232.7	4,122	39,950
Montana					
Sandpoint	2	2	99.3	1,275	3,720
Total		31	641.7	25,017	101,240

* In addition to customers, in all classifications, served directly from this system others are served through numerous stepdown substations at lower distribution voltages.

No Operating Problems

Safety working rules established by our company are the same for the 7,200-v delta, the 7.2/12.5-kv wye, the 12-kv delta and the 12/20.8-kv wye systems. Linemen have voiced little objection or preference as between these systems and preference appears to be one of historical precedence and familiarity rather than any basic differences between the systems. In general the comments are as to the delta and the wye system rather than the voltage level of the system.

An extra dividend is obtained from the 20.8-kv distribution voltage in an area served from a 24-kv subtransmission system. A solution of the problem of overloaded 24/4-kv substations was made by energizing the subtransmission lines at 20.8 kv, retapping the substation transformers and transferring necessary amounts of 4-kv load directly to the 20.8-kv lines. Future for 4-kv load growth would be taken on the 20.8 kv to hold existing stations within their capacity.

All of the wye systems in use, 4, 12.5 and 20.8 kv, on Pacific's properties are multigrounded and with construction in which the neutral of both the primary and secondary systems are common. The benefits of a simple automatic sectionalizing of the distribution lines by the use of fuse breaker coordination is not directly a credit to the higher voltage, except that this voltage has been obtained by wying a lower voltage. The use of a coordinated protective scheme has been expanded on Pacific's wye systems to include the 20.8-kv system and is performing yeoman service in the minimizing of the area faulted and the reduction of total customer outage time.

Pacific's experience with 20.8 has been satisfactory and its expansion in the future is planned.

A sparsely settled, widely ranging rural area in which this voltage permits of long distances covered by a single feeder with good voltage regulation and level

A typical high load density urban area using 20-kv primary in which almost 100% electric heating is used

Edison tackles a critical Western problem. A pilot plant will test . . .

Saline Water Conversion

R. E. Whistler, Mechanical Engineer, Southern California Edison Co.

One of the factors limiting many areas of the West is a shortage of water for domestic, industrial and agricultural uses. Because of the importance of water to the economic development of the southern California area, Southern California Edison has followed with interest projects leading to the conversion of saline to potable water.

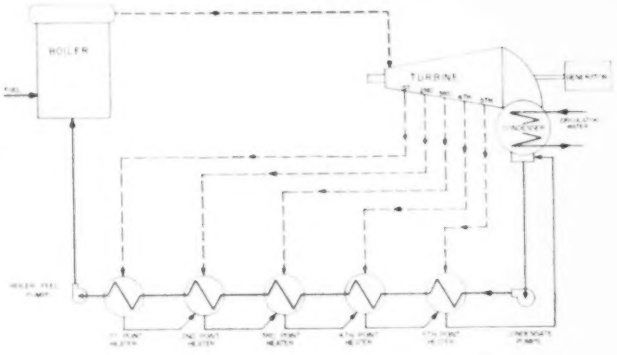


Diagram No. 1 shows the schematic diagram of a conventional steam-electric generating station

Combination Plant

A recent report by the late Prof. W. L. Badger to the Office of Saline Water suggested that the integration of a multiple effect sea water distillation plant with a steam-electric generating station would be reasonably economic. It was believed by Edison management that the company could make a tangible contribution toward the development of an economical sea water distillation plant by building a small pilot plant in conjunction with one of its steam stations. The company's new Mandalay station was selected as a logical site for the pilot plant. The area surrounding the plant is one where there is need for supplemental water supplies. Underground water sources are being overdrawn each year, resulting in sea water intrusion and water of extremely poor quality.

The company prepared a very general specification for a pilot sea water distillation plant having a capacity of about 100,000 gal a day. This size plant was chosen because it would supply boiler makeup for the two present units and because it was large enough to demonstrate the feasibility of the process and design for a large scale plant.

Purity requirements for the water were to conform to the physical and chemical requirements for drinking water set up by the U. S. Public Health Service, the only variation being that total dissolved solids were limited to 500 parts per million rather than the 1,000 ppm maximum set by the Public Health Service.

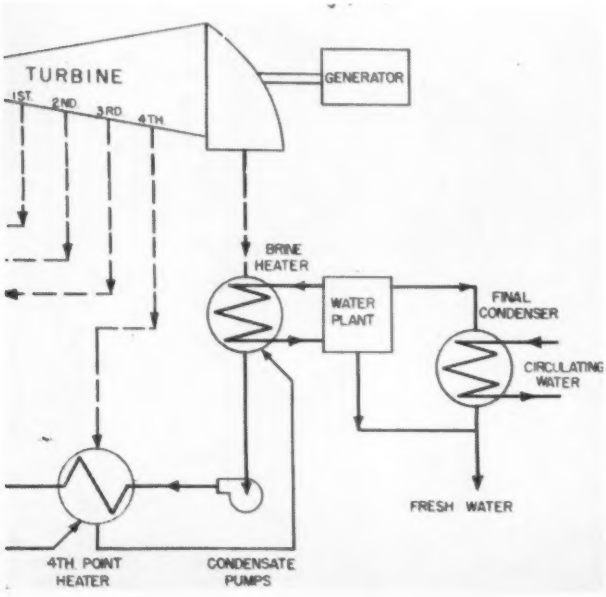


Diagram No. 2 shows how a sea water distillation plant is integrated into the heat cycle replacing the main condenser of Diagram 1

Three Heat Sources

Within the framework of this general specification could be recognized that heat for distillation plants must come from (1) the turbine steam cycle, (2) a warm condenser effluent or (3) the stack gases.

None of the proposals contemplated the use of stack gas. Since the total quantity of heat is low, the cost of building reliable heat exchangers ruled out this potential heat source.

The equipment that was selected is a multiple stage flash evaporator designed to permit operation with steam as a heat source or to flash warm condenser water and condense with cold sea water. Operating with steam as a heat source, the plant can be operated in two different ways—as a once-through or a recirculating system. The equivalent involved was simple and compact, and would lend itself well to scaling up to a large size plant. This, and the ability to evaluate several methods of operation, made it clearly the best plant for pilot operation.

The Plant Cycle

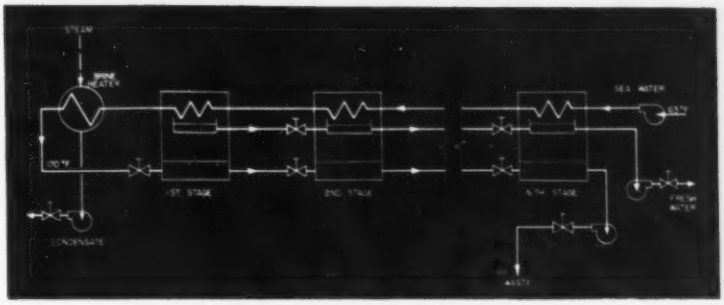
Steam for the pilot plant will be extracted at the fifth point on the turbine, reduced in pressure and desuperheated to 0 psig and 212 F. These conditions have been determined to be optimum after an economic study of the optimum conditions for a full scale integrated plant. Under these conditions, the simplified diagram of a conventional steam station (diagram No. 1) would be modified by placing the sea water distillation plant in the position of the main condenser (diagram No. 2).

Under these conditions the turbine becomes a back-pressure type and would be less costly, because of elimination of the large low pressure stages and the large exhaust hood. One of the feedwater heaters would be eliminated as a result of the higher condensate temperature. In addition, the cost of the main condenser now can be transferred to the water plant. On the other hand, to offset the loss of electrical output brought about by these changes it is necessary to make the entire plant larger. This additional cost would more than offset the savings mentioned above, but not greatly so. The stateline curve (see next page) of the steam flow through the turbine shows that a distillation plant would be working on a difference in enthalpy of 1182 and 1022. This amounts to about 11% of the total heat. This is where the advantage lies in a combined plant, since a major part of the energy in the steam has been used and is producing electricity.

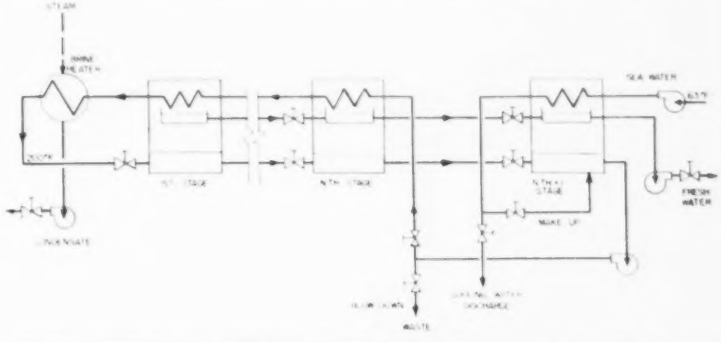
Three Operation Methods

The most significant contribution of the pilot study will be an evaluation of the various methods of operation. The advantages of the once-through method (see box) are: (1) less scaling and low cleaning cost and (2) slightly lower pumping cost. On the other hand, the disadvantage is a lower steam economy due to lower maximum temperature. The recirculating method with greater steam economy will be subject to scaling problems. Because it is a recirculation system, chemical treatment to prevent scaling will be possible and this in turn may enable the recirculating system to operate at temperatures of 200 F or above. Only actual operating experience will determine the optimum balance.

The third method of operating a plant is to flash the warm condenser water with cold sea water as a cool-

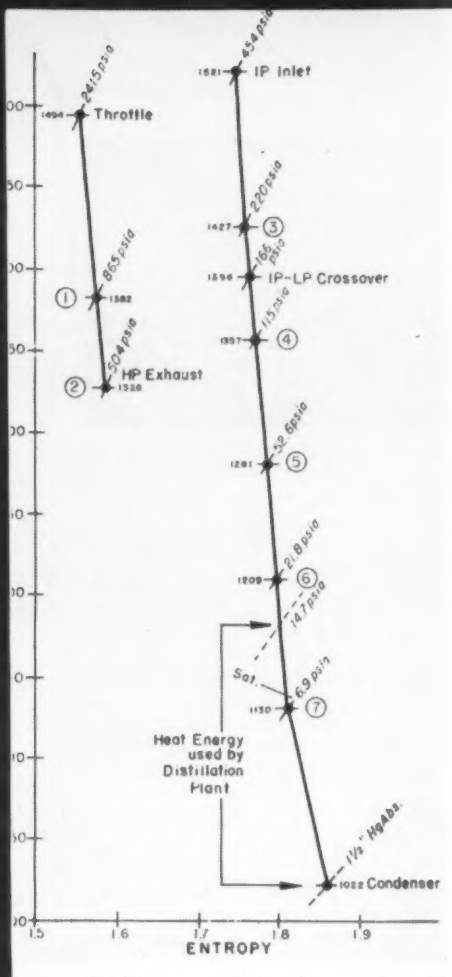


WITHIN THE ONCE-THROUGH METHOD each stage has a flash chamber, a condenser tube bundle and a distillate-collecting trough through the tubes. Cold sea water is pumped through the tubes of each stage from last to first and is heated by condensing the vapor flashed in each stage until it leaves the first stage. Here it passes through a steam heater which raises the temperature to a maximum of about 170 F, a point above which scale formation becomes a serious problem. This hot sea water is then fed into the flash chamber of No. 1 stage through a control valve where a fraction of it flashes to steam and is condensed on the colder condenser tubes. The remainder of the sea water continues on to the second and following stages where the same process is repeated and finally pumped out of the last stage to waste. The condensed vapor falls from the tubes into the condensate trough underneath and is conveyed to the next stage condensate trough where a fraction of it flashes and condenses.



THE RECIRCULATING METHOD of operation differs only slightly from the once-through method just described. Here the last stage is separated from the other stages and made into a "final condenser." Cold sea water is pumped through the tubes of this condenser and discharged to waste, except for a small portion that is used for makeup into the flash chamber of this last stage. The concentrated sea water discharged from the last stage instead of being pumped to waste is recirculated through the tubes of the other stages in a manner similar to the once-through method. Only a fraction of this flow is discharged to waste as blowdown. This blowdown and the makeup can be adjusted to maintain almost any concentration ratio but usually is limited to about two to one.

THE CONDENSER EFFLUENT CYCLE utilizes sea water from the condenser at 84.9 F. The inlet sea water is assumed to be 63 F. Additional stages can be added to improve performance, but it would not be practical to go beyond two or three. Since the total temperature range is only 21.9 F, each stage must provide considerable tube surface to obtain a reasonable output—hence the high cost per stage.



Stateline curve shows the enthalpy difference utilized by the distillation plant

ing medium. There are some basic differences between this method of operation that must be recognized. This system is inviting since there is no charge for the waste heat in the condenser effluent. But equipment cost is high per unit of output, and the output is relatively low. For a 220-mw steam station condenser effluent might produce 1,250,000 gpd of water, whereas a plant using steam from the turbine 212 F might produce 15 to 20 million gpd.

The final evaluation will depend upon estimates of the cost of water from a full scale plant. To assist in evaluating widely the differing approaches to the problem of saline water treatment, the OSW has set up a standard method of estimating costs, which serves as a common basis for their use in comparing different methods. These standard methods include:

Amortization based on a 20-year plant life.

Interest at 4%.

Power at 5 mills per kwh.

Heat at 25¢ per million Btu.

Steam at 55¢ per 1,000 lb.

Land costs $3 per gpd production.

In addition the OSW has set a target water cost of 38.4¢ per 1,000 gal for municipal water and 12.3¢ per 1,000 gal for irrigation water.

In Badger's original study, the cost of water produced in his proposed plant based on OSW standards was estimated to be only 23¢ per 1,000 gal, if the electric power could be sold at 5.16 mills per kwh. This, we believe, is very optimistic. It is, however, good reason for installing a pilot plant of sufficient size to be able to evaluate a large scale plant.

Montana Dam Holds

EARTHQUAKE damage to Montana Power's Hebgen Dam Aug. 17 is not considered serious, according to engineers, unless another earthquake occurs. A concrete core that runs the full length of the dam was cracked in three places, the largest about 1½ in., and there is a crack in the spillway.

The 44-year-old dam withstood a quake that registered 7.8 on the Richter scale (the San Francisco quake of 1906 was 8.25), and violent wave action that splashed water 18 to 20 ft over the dam and lowered the reservoir level two feet.

A small power plant that generates electricity for use at the camp suffered some damage from falling rocks, dirt and trees, and was deluged by water coming over the dam.

A huge slide some five miles downstream from Hebgen caused the death of a number of vacationers and injured many more, but visitors in the immediate area of the dam who were trapped were successfully rescued by boat and helicopter. About 40 people sheltered themselves in a recreation and meeting building Montana Power maintains at the site.

Falling debris damaged small power plant

Unless repairs are more extensive than presently anticipated, Montana Power officials do not foresee any effect on the power supply. The dam is not leaking, despite the cracks that have been discovered. It serves as a storage reservoir for downstream generation of electricity in eight generating stations on the Madison and Missouri Rivers. Capacity of the reservoir is 345,000 acre-ft. Each cfs released generates 46 kw in passing plants.

Cracks in soil are evidence of violence of quake. Marooned visitors contrived signal

California Electric Power's modern transportation equipment repair shop handles routine maintenance or complete overhaul

Calelectric develops maintenance work units to . . .

Measure Shop Load

C. L. Gallup, Superintendent of Transportation, California Electric Co.

In an effort to determine the requirements of shop employees as a function of the kind and number of vehicles to be maintained, a study of the previous 10-year period showed that a system of per unit vehicle maintenance work units could be developed. The standard passenger car was chosen for a basic work unit of one, since this is the kind or class of vehicle on which there is the greatest knowledge of repair costs. Using the standard passenger car as a base measure, other kinds and types of vehicles work unit multiplier relates the actual dollar cost of repairs of the given vehicle to the known cost of passenger car repairs. The theoretical work units shown in the table, which were developed from the 10-year study, checked closely with the actual ratios of repair costs for 1958 for each class of vehicle.

Study Required

Since most Western utilities serve some mountainous or desert areas, it was felt that the extra maintenance required of vehicles in these circumstances needed study. The result was a special set of units developed for desert and mountain road service.

The work units have been established on a per-unit system. This basis was chosen because it was not affected by changing labor and material cost. It is believed that these work units are as fair and reliable as any method previously used in establishing work loads for utility vehicle repair shops.

The maintenance work units for any particular group of vehicles as compared with the basic unit for passenger cars may vary from one fleet to another depending upon such factors as average age of vehicles, replacement policies, maintenance program and extent of sublet repairs.

Vehicle Maintenance Work Units

Vehicle Maintenance Class and Description		Vehicle Maintenance Units Good Roads	Vehicle Maintenance Units Desert and Mountain Roads
1	Passenger cars	1	1.5
1a	Passenger cars with 2-way radio, special generators, special compartments	1.2	1.7
3	Carryalls and station wagons	1.3	1.8
4	Pickups	1.1	1.6
4a	Pickups with 2-way radios, service bodies, special equipment, 4x4	1.3	1.8
5	Trucks to 16,000 gvw	2	2.5
6	Trucks over 16,000 gvw and 4x4, 6x6, line trucks	3	3.5
7	Trailers (small cargo, pole dolly, reel railers–2-wheel)	0.2	0.2
7a	Trailers (4-wheel flat bed, dual axle pole dolly, low bed, etc.)	0.3	0.3
8	Tractors, skip loader, road grader	4	5
9	Wash rig (6x6)	10	. .
0	Hole digger truck	6	7
A	Air Compressors, fork lifts, Krane Kars, Sno Cat, etc.	0.5	0.6
B	Small motorized equipment (motor-generator, power mower, boat motors, chain saws, cement mixers, etc.)	0.1	0.1

Variety and Versatility . . .

Electric Heat Keeps Metal Flowing

Albert L. Stone, Electrical Engineer, Du Pont Antioch Works

Continuous chemical processing of molten metal as accomplished by the Du Pont plant in Antioch, Calif., calls for large amounts of continuous, efficient and closely controlled heat applied to transfer pipe lines and holding pots. The situation called for electric heat – and five types were installed.

To meet critical heating requirements ranging from 200 F to 1,000 F, the following electrical systems are in use:

1. Pipe Lines—60-cycle induction heat
2. Pots—60-cycle induction heat
3. Pot Inlets—Serpentine heating
4. Dip Legs—Tubular radiant heating
5. Pipe Lines—Resistance heating

Each system was designed to handle the heat load continuously and has been in service in the Antioch works for the past two years.

Pipe Lines—Induction Heat

More than 500 ft of 2-in. ferromagnetic pipe is used in the transfer of molten metal. Wrapped around the pipe are approximately 10 turns of No. 4 RHWN (rubber covered, heat resistant, weatherproof, neoprene jacketed) wire per linear foot. Four inches of insulation separates the pipe and induction wire, and each induction circuit heats a 20- to 30-ft length of pipe. A total of 21 circuits are used to heat all lines. Fig. 1 shows how each circuit is fed by a 440-v, 60-cycle, size 1 conductor and a 5-kva single-phase transformer rated 440/49, 57, 65, 73, 82 v. A primary tap switch allows selection of the most appropriate voltage.

Also, Fig. 1 shows how each induction circuit is controlled by an "on-off" temperature recorder-controller located in the central control room. Thermocouples are bolted directly to the pipe lines at 2-ft intervals to monitor line temperatures.

A 24-point recorder-controller is used to record and control each induction circuit temperature. Either automatic or manual contactor operation is possible with the temperature being recorded in either mode.

As voltage is applied to the induction circuit, current alternates in first one direction then the other at the 60-cycle frequency. Resistance and reactance limits the current to a value between 50 and 70 amp depending on the applied voltage. Voltage is induced into the pipe in much the same manner as voltage is induced in the secondary of a transformer.

Heat is caused, then, by a combination of induced current around the pipe periphery resistance, eddy currents flowing through the pipe resistance, and internal molecular friction due to cyclic magnetization. Pipe lines now in use can be heated to 1,000 F and maintained at this temperature indefinitely. When the circuit temperature reaches the control point the contactor is opened and de-energizes the induction circuit. As the pipe line cools, the contactor is closed by a relay signal from the recorder-controller and the induction circuit is re-energized.

A typical induction circuit 21 ft long operates at 45 v, 60 cycles, one phase, 71 amp, 2.7 kw, .84 pf, 10 turns per foot, and is on 81% of the time. Cost of the power is $15.80 per month.

To assure that temperatures are maintained within a suitable range and to avoid overheating, thermocouples are installed at 2-ft intervals along the pipe, and are monitored in the central control room by a selective dial potentiometer. Temperatures on the surface of the insulation are only slightly above normal room temperature.

Once installed, an installation is practically trouble-free.

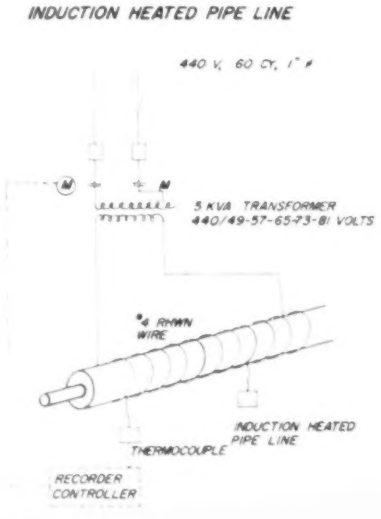


Fig. 1

The Author

Albert L. Stone graduated BSEE 1950, Duke University with honors of Phi Beta Kappa, ODK, Tau Beta Pi, and listed in Who's Who in American Universities.

He joined Du Pont in 1952 as a construction engineer at Atomic Energy's Savannah River plant. After construction was complete, he moved over to operations as an electrical engineer. Since February 1956 he has worked as a maintenance supervisor of electrical work at Du Pont's Antioch Works.

He is a member of AIEE.

Pots—Induction Heat

While the process is continuous, there are, of course, points at which molten metal collection and distribution pots are necessary. It is imperative that the metal be maintained in the molten stage while in these pots (8 ft in diameter, and 8 ft 9 in. high). Therefore, pot heating becomes necessary, and it is accomplished with 60-cycle induction heat.

Wrapped around each pot are coils of wire of sufficient size to carry the high currents. Fig. 2 shows a typical pot having two circuits: an upper winding of 47 turns, and a lower winding of 33 turns. With 440 v, 60 cycle, one phase applied to these windings, the upper winding requires 170 amp while the lower winding current is 300 amp. Temperature control is maintained at any desired point between 800 F

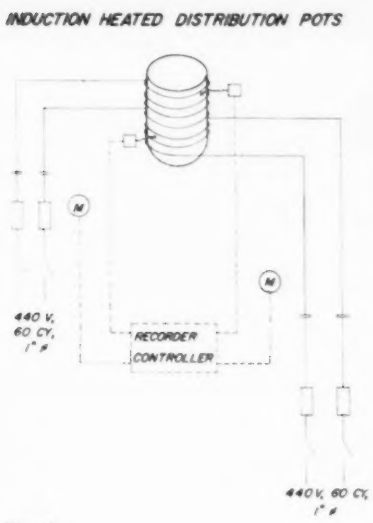


Fig. 2

and 1,000 F by means of thermocouple signals to a recorder-controller, which in turn controls the 440-v contractors. Fig. 2 is a schematic of a typical pot. The total power consumed is 92 kw. The circuit is on approximately 50% of the time when being controlled.

In theory, the induced voltage causes current flow in the pot ferromagnetic material, which combines with the internal molecular friction caused by cyclic magnetization to create the desired heat. Between the pot and the induction wire sufficient insulation is placed to make the outside temperature barely warm to the touch. Micarta ribs are used to support the induction wiring.

An experiment was run to determine induced currents and voltages in surrounding metallic objects. A metallic shield was constructed to surround the top of a pot completely except for a 3-in. gap. The shield was doughnut shaped, 2 ft wide, and was arranged to make a rooflike structure over the top of the induction coils. A measurement across the gap showed only 1.3 v a-c present. To measure the current, a clamp-on instrument was used around a ⅜-in.-square shorting bar. The current was 225 amp. Insulated segments are used for shielding purposes to prevent closed magnetic loops and induced currents.

Pot Inlets—Serpentine Heating

Induction heated lines are terminated in pots through valves and easily removed connectors called "Wye" pieces. Flanges and odd-shaped configurations do not lend themselves to effective induction heating. Therefore, a flexible 600-w resistance heater called a "Serpentine" is used as shown in Fig. 3. For ease in disconnection these heaters are plugged into 110-v, 60-cycle receptacles, fed from a heating transformer (separate from building lighting) through a circuit breaker panel and control relay. Thermocouples on each Wye piece and valve are monitored in the central control room on a recorder-controller in the same manner as the induction heated lines. "On-off" control is supplied to the relays for each circuit with a pilot light in the central control room to indicate when power is on.

The Serpentine heater, as pictured

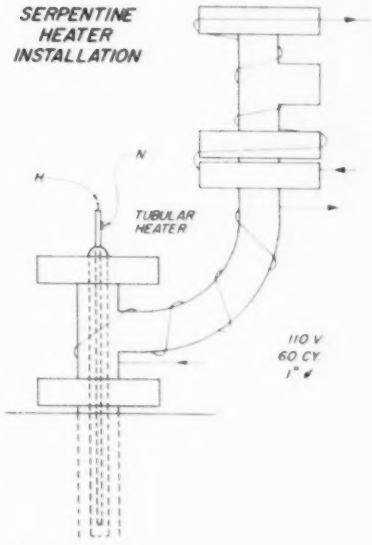


Fig. 3

in Fig. 3, is 12 ft long. Each end has a flexible unheated 1-ft section designed particularly for entering and leaving the Wye piece through 4-in. insulation. The lead wire has high temperature glass and Teflon insulation. Over 48 Serpentine installations are used at an operating cost of $7.44 per month each.

Dip Legs—Tubular Radiant Heat

From the top of each pot a section of line called a dip leg extends into the molten metal and requires heating. Tubular heaters are used to supply this dip leg with heat. One end of these 3,000-w, 115-v, 60-cycle tubular heaters is brazed to the sheath. At the top end of the heater a return ground wire is attached to the sheath while the hot wire is connected to the resistance wire terminal (refer to Fig. 2). Also at the top end a ¾ in. to ½ in. reducer fitting is brazed on and the heater screwed into a pressure protective well. Receptacles are used for these tubular heaters as they are for the Serpentine heaters. However, the receptacles are not interchangeable and the voltage is supplied by manually operating an individual circuit breaker. Individual ammeters are installed on each circuit for monitoring purposes.

Pipe Lines—Resistance Heating

Some process piping requires only moderate heating in the range of 150 F to 300 F. To solve this problem, a ¼-in. iron pipe is installed next to (but electrically insulated from) a 3-in. process pipe 200 ft long. These two pipes are joined at one end while 115 v, 60 cycle, single phase is connected between the two at the other end with the hot wire connected to the smaller pipe. Since only the pipe resistance is used to limit the current, approximately 128 amp flows in the circuit. The heat generated by this high current through the ¼-in. pipe is sufficient to maintain the 3-in. pipe temperature within the required range.

Fig. 4 shows a cross section view of this type heating.

Insulation is adequate for outdoor use of this line. Supports for the line surround both pipes and are on the outside of the insulation. Expansion joints for the ¼-in. pipe are installed every 20 ft to prevent line

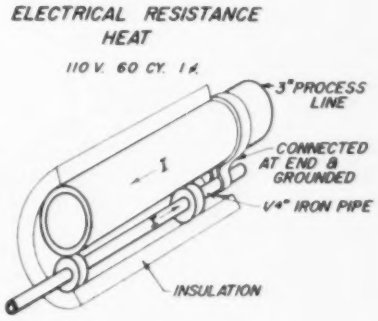


Fig. 4

warping. After two years of continuous 24-hour service no troubles have developed on this line.

Electrical heating at the Du Pont Antioch Works has proved advantageous over other possible types of heat as follows: (1) versatile in application, (2) clean, (3) dry, (4) easily controlled to close tolerances, (5) compact, (6) maintenance free and, because of these other advantages, (7) economical.

Meeting in San Diego, IAEL officials are told to . . .

Think Big, Beat the Competition

League managers were reminded of the important role they play in the industry's coordinated promotion program and were urged to increase membership and budgets when the International Association of Electrical Leagues held its 24th annual conference in San Diego, Aug. 11-14.

The conference began and ended on this note, with speakers warning against complacency and advising the group to go out after more and bigger associations, greater utility support with more money to spend.

Second such conference to be held in the far west (IAEL met in San Francisco in 1953), it was hosted by Clark Chamberlain, secretary-manager, San Diego Bureau of Home Appliances, and San Diego Gas & Electric Co.

More Support Needed

Leagues have no ax to grind; all they have to do is beat the socks off the competition—from other fuels and for the consumer dollar, President John S. McDermott, Electric Assn. of Kansas City, said in his keynote address. Pointing to the strength of the associations, he went on to say that he found two glaring shortcomings: (1) too few local leagues; (2) insufficient industry support nationally and locally for many now existing.

The last two speakers at the final morning session were even more emphatic in urging IAEL to take the leadership in industry promotions.

Stating that he sees too few signs of growth in the league movement because its leaders don't think big enough, Laurence Wray, editor of *Electrical Merchandising*, told managers to sell themselves to their many bosses, to demand and get more support and more money. If he were a league manager, he said, he would see that all utility promotional money was allocated to his league and the amount would be doubled; utility advertising staffs and home economists would consult and work with the league; shows, studies and similar activities would be under league management; it would act as employment agency for the industry.

Utilities have consistently underrated the leagues' potential for promotion he declared.

At the retailing level, nobody is going to fight a competitive fuel battle. The utilities will have to take the initiative and electric leagues should be made the channel for this promotional work, Wray declared.

One Umbrella Program

Coordination of all electrical industry promotional effort under one umbrella—IAEL—with all the money in one pot was counseled by Carl T. Bremicker, vice-president of sales, Northern States Power Co., Minneapolis. Under his plan all promotion programs would be coordinated on a broad industry level with a "budget that would make the present $2.5 billion utility expenditure look skimpy." If you aren't in trouble in your league, you're not doing your job, he said, so be happy getting into trouble. But be the captain, he advised; make the crew do the work.

Load Growth

James T. Coatsworth, commercial director, Edison Electric Institute, sees the recognized aggressive competition of gas and a degree of complacency and lethargy on the part of the electric industry as the two dark clouds on the horizon. His talk sketched growth and trends in all markets—industrial, commercial, farm, residential.

If the industry is to continue to double kwh sales each decade, an increasingly greater effort will be needed, he declared, since population, housing starts, automation and electrification do not increase at anywhere near a comparable rate.

All indications are that if this goal is to be met in the future the industry must promote electric space heating to a degree far in excess of today's effort and to a degree somewhat greater than most company managements are now planning, he believes. As in any other new promotion or field, money will be needed to develop and service this activity, he stated.

One major and fundamental factor —comparative fuel cost—will have a tremendous bearing on the trend in

electric load growth, Coatsworth declared. Customer attention is being more and more directed by the competition to operating costs, especially where heating is involved. The downward trend of electric rates is a tremendous selling point and will have its greatest influence in the market of electric space heating, where company after company is offering new low rates.

As the years go by and the indicated spread in favor of electric fuel becomes a reality, more and more opportunities for load growth will materialize, he concluded.

Electric heating will be installed and in mushrooming numbers but who will sell it and who will install it is still a matter of conjecture. This was brought out by H. G. Blumberg, Cadillac Electric Supply Co., Detroit, who placed upon IAEL's shoulders the responsibility for keeping a profitable and growing business within the channels of the electric industry. It is of the utmost importance that every major marketing area adopt some form of cooperative, coordinated promotional and educational effort to retain this business, he believes.

Advertising Programs

How San Diego coordinates its advertising campaign by knitting together the know-how of several active study groups within the bureau, the utility's advertising department and its advertising agency was outlined by F. M. Raymond, advertising and public relations manager of San Diego Gas & Electric Co., and Norman B. Foster, vice-president, Barnes-Chase Advertising Co. There was much meat in this witty presentation from a company that has kept its kwh sales climbing and is responsible for a number of "promotion firsts."

Unification was the subject of another utility man, D. J. McGonigle, general sales manager, Montana Power Co., who told of the highly successful Electro-Day program initiated by his company. Its inception would have been easier, he said, had there been an electric league in the utility's service area.

A coordinated advertising program, Electro-Day is based on the belief that the industry should completely dominate the papers one day a month, preferably early in the first week. Although the concept and its identifying symbol have been registered by Montana Power, others can secure permission to use it, McGonigle said. He added that after his retirement Sept. 30 he would be

Host Clark Chamberlain, San Diego Bureau of Home Appliances (second from left), discusses the conference program with Robert Trottier, IEA, Salt Lake City; John Biggi, IAEL corresponding secretary, New York; Bill Johnson, AMA, Phoenix

President John S. McDermott (second from left) talks between sessions with Ralph Hubbard, RMEL, Denver; R. J. Harrison, Omaha; D. J. McGonigle, Montana Power Co. Hubbard was named Division 3 representative on the National Governing Board

Glen Logan, Electric League of Los Angeles, left below, will represent Division 4 on the Governing Board. With him here are Bert Reynolds, NCEB, San Francisco; Harry O'Laughlin, SVEL, Sacramento; Vic Hartley, managing director, PCEA, Los Angeles

pleased to help any in the group who would like to launch such a program.

NECA Market Analysis

It will be to the industry's own self-interest to give local NECA chapters effective moral support, Paul M. Geary, Washington, D. C., executive vice-president of that association, pointed out in reporting some of the findings in a still unpublished market analysis conducted by a New York syndicate. Among the findings:

(1) It is estimated that during 1957 there was a little over $14 billion of electrical installation, maintenance and repair work done by somebody; (2) potential customers need and will use the services of the electrical contractor but they have to be sold; (3) the average electrical contracting concern is very weak in sales capacity, a little weak in financial capacity and strong in production.

Handling a $14 billion volume probably would represent an annual productive labor pay roll of about $5 billion, Geary estimated. Last year the industry, as we know it, had a little less than $1 billion of pay roll, he said. Even allowing for a large measure of error in the national statistics, there is still a lot of opportunity for business, which must be sought out and secured by local groups. There is opportunity for local electrical leagues to assist in this effort, he believes.

National Promotions

In 1960 EEI's National Electric Living campaign will be known as the Live Better Electrically program, Don Willis, vice-president of sales, Arizona Public Service Co., reported. The new program, representing work over a four-month period by 140 sales executives, will be broadened in scope to include the Medallion Home and the important subject of residential electric heating and cooling, Willis said.

In his talk, National Electrical Week Is Here to Stay, Herbert E. Cook, Electrical Assn. of Detroit, recommended greater cooperative effort at both the national and local levels to achieve the goal of 100% participation. Slightly more than 50% of national advertisers and about 50% of the leagues participated in 1959, he said. Among suggestions from manufacturers, which he read, was that greater localized group effort be incorporated into the program since too many independent and divergent programs result in no participation in some cases and duplication in others.

Next year's officers, elected at the annual business meeting: (seated) C. C. Simpson, Electrical Assn. of Chicago, president; W. M. Freudigman, Electrical League of Rhode Island, vice-president; (standing) R. J. Harrison, Nebraska-Iowa Electrical Council, treasurer; Robert O. Trottier, Intermountain Electrical Assn., Salt Lake City, secretary

How one manufacturer views National Electrical Week was presented by Charles G. Arps, Public Relations Division, Allis-Chalmers Mfg. Co., Milwaukee. With high stakes for the manufacturer, such a program has one inherent danger, the tendency to forget the other 51 weeks and concentrate all our efforts into one. A program of this nature he believes must be a continuing one from day to day, week to week and year to year.

If there is room for a commercial lighting promotion in your program, the National Lighting Bureau has the tools to help you make it "tick," according to William M. Freudigman, promotion manager, Narragansett Electric Co., Providence, R. I., who reported on the Eye-Fi Relighting program. These tools include a technical and sales training program; a certification package that lends itself naturally to a contractor contest; a national advertising program. The potential for added revenue from commercial lighting is just as great as it ever was, Freudigman declared.

Reviewing plans for residential and commercial wiring promotion in 1960, Lester E. Barrett, Barrett Electrical Supply Co., St. Louis, chairman of the National Wiring Bureau, stressed the fact that the bureau is not discarding the Certified Wiring program as long as any area feels that it is valuable. The emphasis, however, will be on residential wiring modernization, directed within the industry and especially to the electrical contractor. A commercial wiring program also will look to the modernization market.

Organization

That a successful electrical league doesn't just happen was evident in the talks of three league managers on organization and leadership. Ralph B. Hubbard, Denver, A. H. Kessler, Minneapolis, and John A. Morrison, Philadelphia, told of conference planning, developing leaders and "pretesting" of industry activities before presentation to the membership.

Appliance Service

Troubles in the appliance servicing industry were discussed by a panel, including a homemaker and representatives of two service organizations. Mrs. John Murphy of La Jolla, Calif., attributed customer complaints to two factors—overselling and misselling in advertising media and lack of rapport between branches of the industry and their customers. A little of the money spent on advertising could be spent on demonstrating the machines, she thinks.

Keith Chamblin, vice-president, California Electric Service Co., Los Angeles, states: "For some reason, unknown to us, the average manufacturer, distributor and dealer still does not seem to recognize the tremendous importance of sound customer relations in regard to service

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Certain design characteristics count heavily in the selection of air switches.

Appearance is important, especially where the switch is to be part of a modern substation. The RDC is streamlined. It has no exposed cranks, arms, or clevises to mar its smooth contours.

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Ease of operation is always a prime consideration. The RDC, with the weight of the blade balanced on the center insulator, operates with ease in any mounting position.

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For complete details, see your Southern States representative, or write us direct for Technical Bulletin 58RDC.

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as it might affect his future sales." He suggested that the leagues form an Electrical Housewares Servicing group.

Admitting that the service industry is sick, John F. Camp Sr., Camp Electric Co., Memphis, refuses to believe that the problems are here to stay. He believes that they are the growing pains of a young industry and the rapidity with which they have developed is caused by the changeover from manual to automatic appliances without due regard to consumer education on use, care and maintenance.

Things to Come

"Apartness," a counter movement to "togetherness," is a new concept of living that is accounting for a trend toward special-purpose rooms and devices, George T. Bogard, General Electric Co., Louisville, brought out in "What's Ahead for the Appliance Industry." He sees a strong possibility that an expanded major appliance business is linked to the kind of houses that are built for the future. Slides showed a fragmented house that can be manufactured and sold like a major appliance.

As a nation we have not used our vast reservoir of knowledge to its utmost, Robert B. Bell, president of Packard Bell Electronics, Los Angeles, charged in a talk on the electronics industry in the Scientific 60s. While accent will be on space, missiles and electronics, "industry-conscious areas will make certain that, as man seeks to build streets on the moon, the by-products of his seeking will be merchandized and sold on Main Street—Earth," he predicted.

The near "break through" in the field of thermoelectric power was discussed by Tuesday's luncheon speaker, Dr. Park H. Miller Jr., director, experimental physics group, General Atomic Division, General Dynamics Corp., San Diego.

Despite the wide range of subjects covered, the program committee left time for sightseeing and hospitality. Those who have attended other conferences in San Diego will not need to be told that nothing was left undone to make these free hours memorable. Tours of old Mexico and San Diego, hospitality hours and dinner meetings, a Starlight Opera were arranged for the entire group. In addition, a special program for ladies was planned by Mrs. Clark Chamberlain.

The group voted to hold its 1960 conference in Kansas City, Oct. 5-7. It will meet in Atlantic City in 1961 and in Chicago in 1962.

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There's a Royal "POWR-KORD" for every need:

- RUBBER or VINYL
- BLACK or RED (rubber)
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- HANDY LENGTHS — from 10' to 100'
- IN THESE TYPES and SIZES:
  #18 and #16 SJ — 2- and 3-conductor
  #18 thru #12 S — 2-conductor
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  #18 and #16 SJT — 2-conductor

. . . the all-quality line of all-purpose heavy-duty extensions

Here's the kind of rugged construction that pays off on the job: MOLDED-ON caps and connectors, — built-in strain reliefs — Royal-quality cord — heavy brass blades and double-wipe contacts — locked-in-place molded construction . . . and FULLY UL LISTED!

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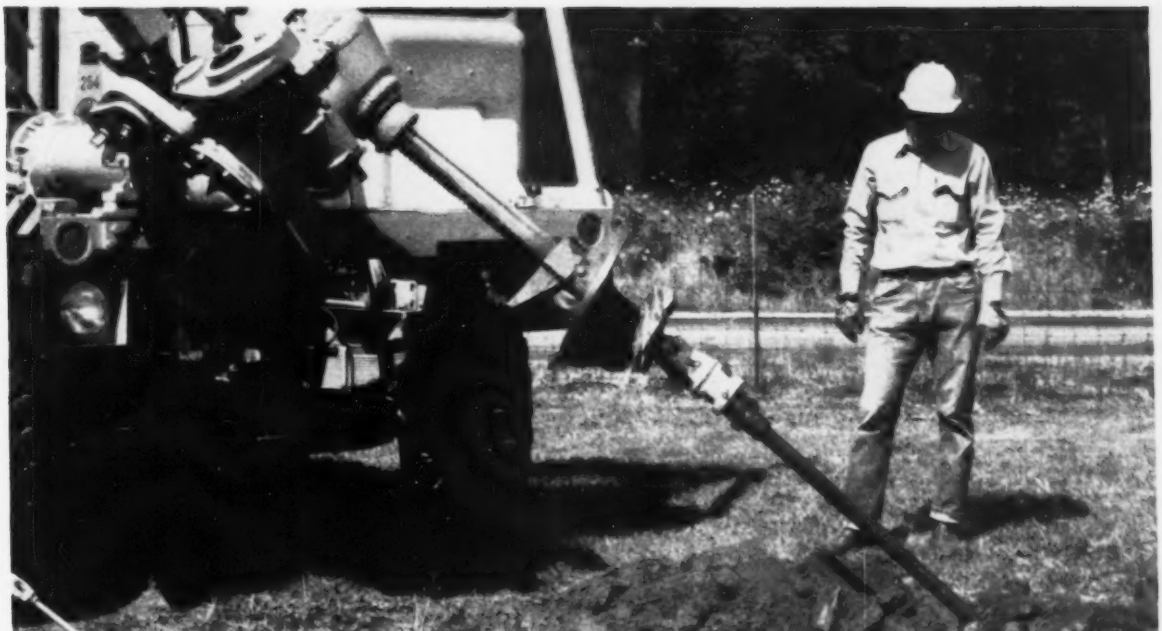


POWER-INSTALLED SCREW ANCHORS

average 5 to 8 man-minutes for complete installation

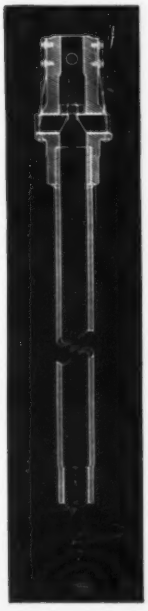
Latest advance in anchoring technique speeds line construction . . . realizes greater value from investment in hole-boring equipment

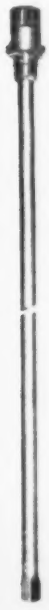
If your company uses power hole-digging equipment for line construction, you can now use that equipment to install the new line of Chance Screw Anchors.

Chance Power-Installed Screw Anchors, ranging from 78 to 176 square inches in area, can be speedily installed in all types of soil, except extremely rocky soil. Your present power boring equipment, regardless of type, can be easily adapted to power anchor installation. Only one new part is needed—the wrench shown below. This wrench transmits torque from the power equipment directly to the specially designed hub on the anchor helix. Since the anchor rod is not subjected to torque, it only has to be heavy enough to support the guy load—a cost-saving factor.

Installation procedure is extremely simple. *Step one* is to remove the Thimbleye or Twineye nut and slide wrench on the anchor. *Step two* is to fasten the wrench to the "Kelly Bar" of the power-digger, or, to fasten the wrench on the pilot bit of the auger using an adapter. *Step three* is to drive the anchor with the power equipment. *Step four* is to release the wrench from the anchor and retrieve it from the ground. (The spring-loaded "dogs" that lock rod in position are easy to release.) *Step five* is simply replacing the Thimbleye on the end of the rod—your anchor is ready for hooking up the guy wire.

These five steps are accomplished in a matter of minutes. Repeated time tests in various types of soil prove that Power-Installed Screw Anchors averaged only 5 to 8 man-minutes for a complete installation *—from the time the equipment was moved into position until the anchor was ready for the guy!*





THE ONLY PART NEEDED is this special wrench. (Diagram shows how it fits the anchor.) Wrenches are made to fit all popular makes of earth-borers.

THIMBLEYE and TWINEYE guy-wire nuts are available. They distribute pulling stresses uniformly and keep guy wire from spreading, kinking, or bending.

SHARP CUTTING HELIX of high strength structural steel is tapered to minimize earth disturbance. Special hub fits lower part of wrench.

CA59-218

PULL TESTS PROVE HOLDING POWER

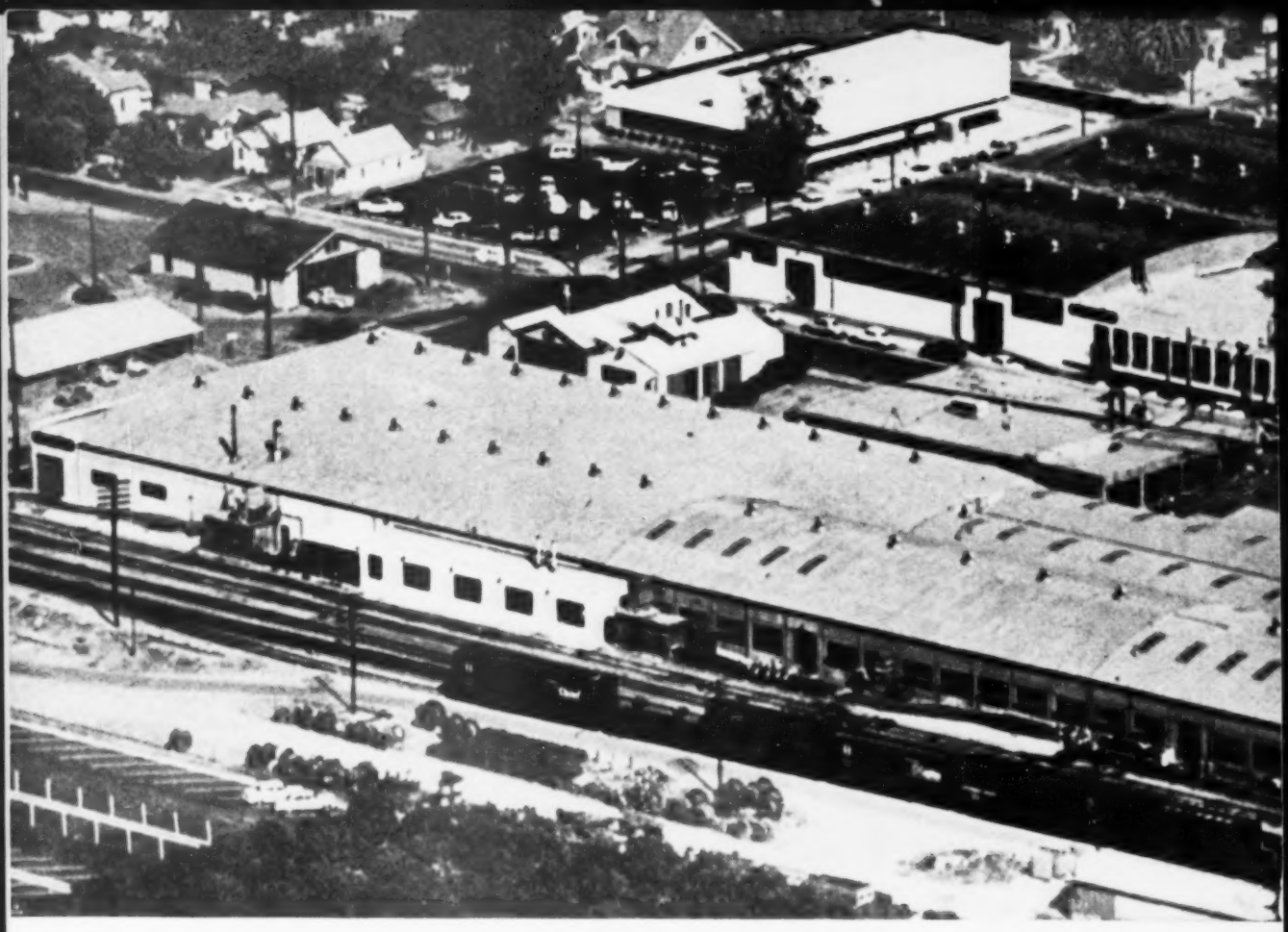
During the engineering and development stages of these Power-Installed Anchors, several hundred tests were made to check the anchoring dependability of power-installed screw anchors. Each anchor was pulled by a mobile testing unit to determine maximum holding power. Complete test data is given in Bulletin 868. Address your Bulletin requests to...

A. B. CHANCE CO.

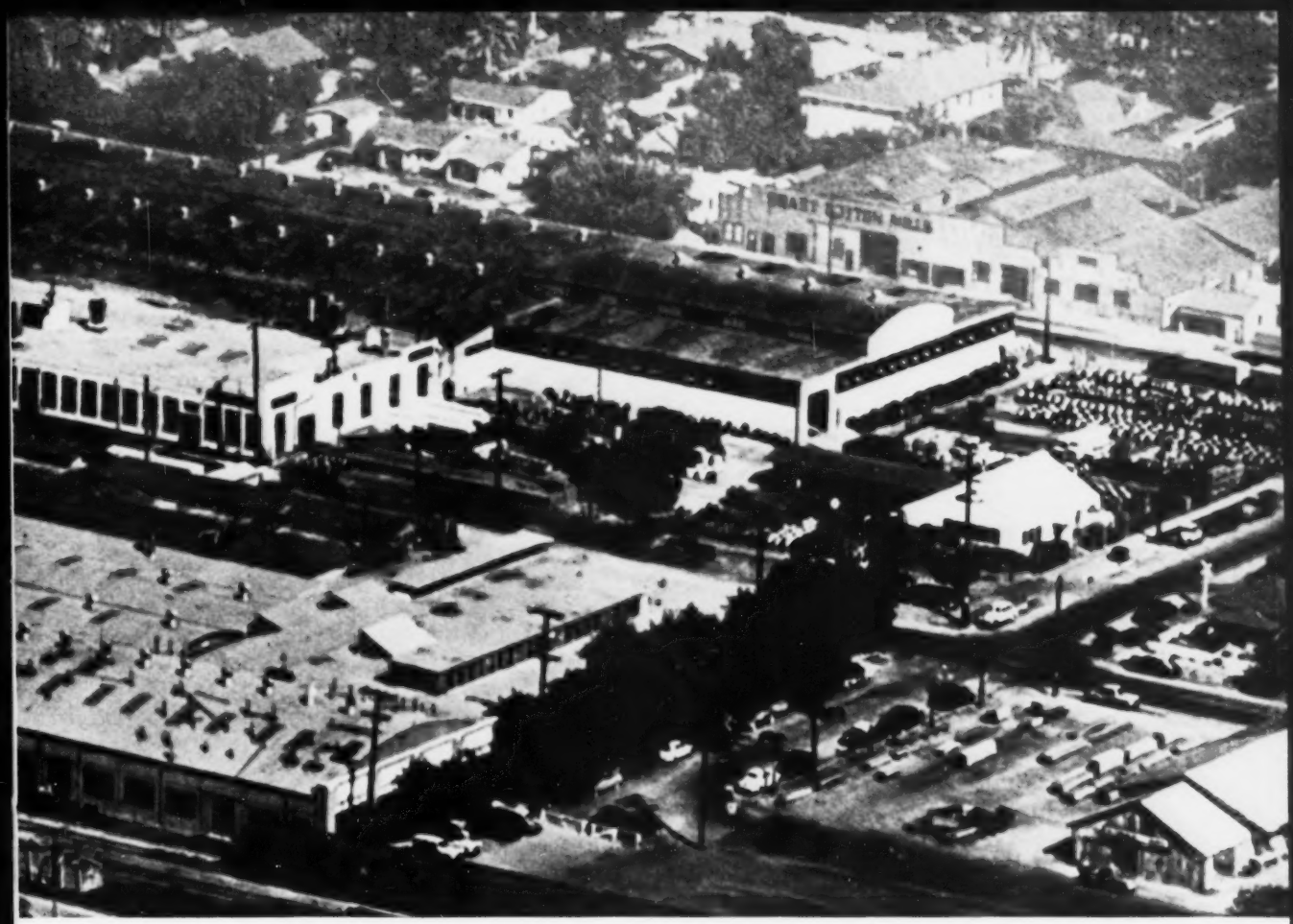
CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

For phone number of closest representative see advertising index in back of book.



THIS IS ANACONDA—



AT ORANGE, CALIFORNIA

From Anaconda's modern Orange, California, plant . . . wire and cable service that's the most complete in the West!

The Orange, California, mill is an important part of Anaconda's map of the United States. Together with a brand-new mill service center, this mill is completely equipped to manufacture and supply a full line of products used by utilities, industrials, railroads, original equipment manufacturers, contractors, distributors and other users of electrical wire and cable—the Orange mill is *the* integrated mill of the West.

In addition, the complete research and engineering facilities and the varied manufacturing skills of the entire Anaconda Wire & Cable Company are available to—and stand behind—the Orange, California, mill, an expression of Anaconda's pride in being part of our Western states' growth and progressiveness.

Write for Anaconda's informative guide to the West's most complete wire and cable service to: Anaconda Wire & Cable Company, 303 West Palm Avenue, P.O. Box #109, Orange, California.

WESTERN DISTRICT SALES OFFICES ARE LOCATED IN:
Denver, Colo. • Los Angeles, Calif. • Salt Lake City, Utah
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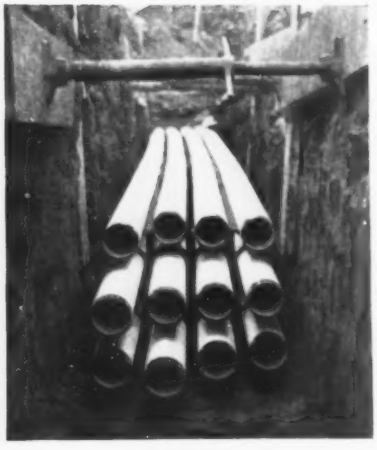
ANACONDA®

COPPER AND ALUMINUM WIRE AND CABLE

Get peak cable protection ***at lowest dollar cost***

Transite Ducts can be laid directly in trench without concrete envelope. Or if ductbank is to be concrete enclosed thinner walled Transite Duct may be used. In all other respects both heavy-wall and thin-wall Transite Ducts are identical.

Transite Ducts save on the job and after!



No other duct material gives you so many installation and in-service economies

In every way, Transite® Ducts are the most efficient electrical ducts you can install. And—when assembled with J-M's Plastic Coupling—their cost is remarkably low!

One reason for this economy is in installation. Strong, lightweight, long—Transite lengths are easy to handle and install . . . Your men set the ducts in place easily, join them tightly in seconds. Transite's smooth bore is free of burrs and obstructions. Thus, long cable pulls are easily accomplished with no damage to cable sheathing.

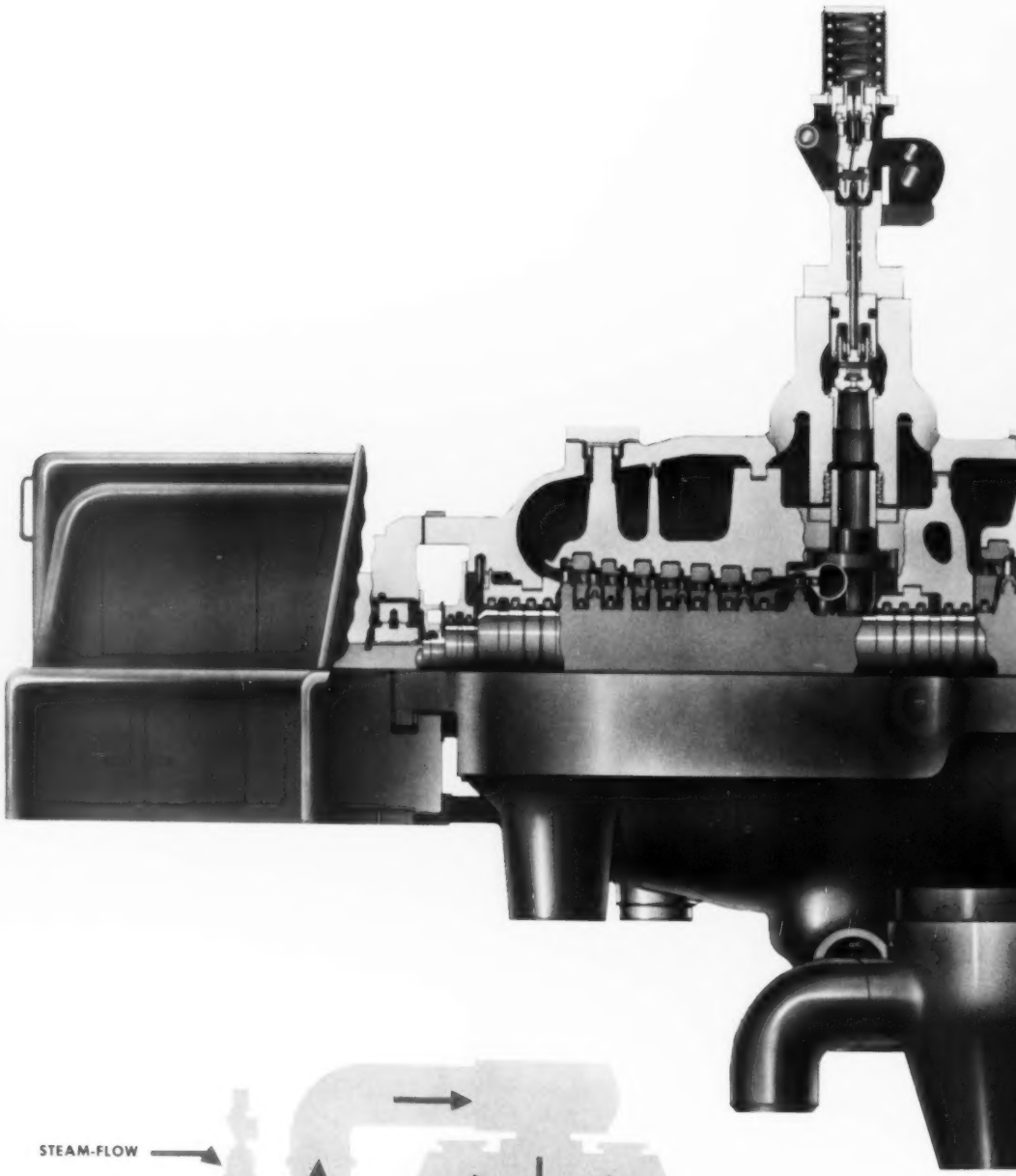
You see another reason for Transite's economy in performance. Once in service, Transite's unusually high rate of heat dissipation means cables run cooler, last longer. Transite also confines arc damage . . . cannot burn, smoke or fume. It won't generate explosive or toxic gases. If arcing does occur, Transite Ducts won't sag or adhere to cable.

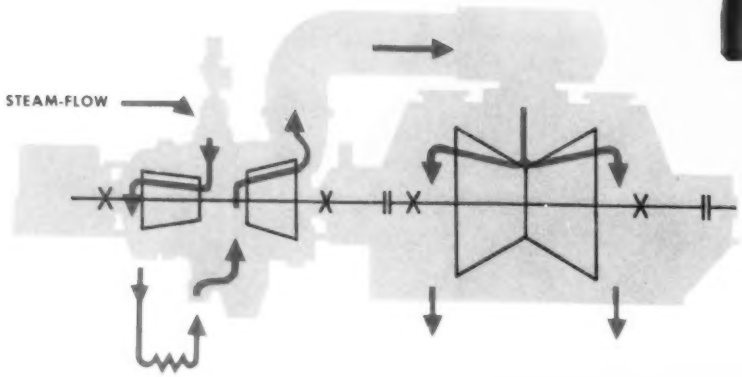
Let us send the Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

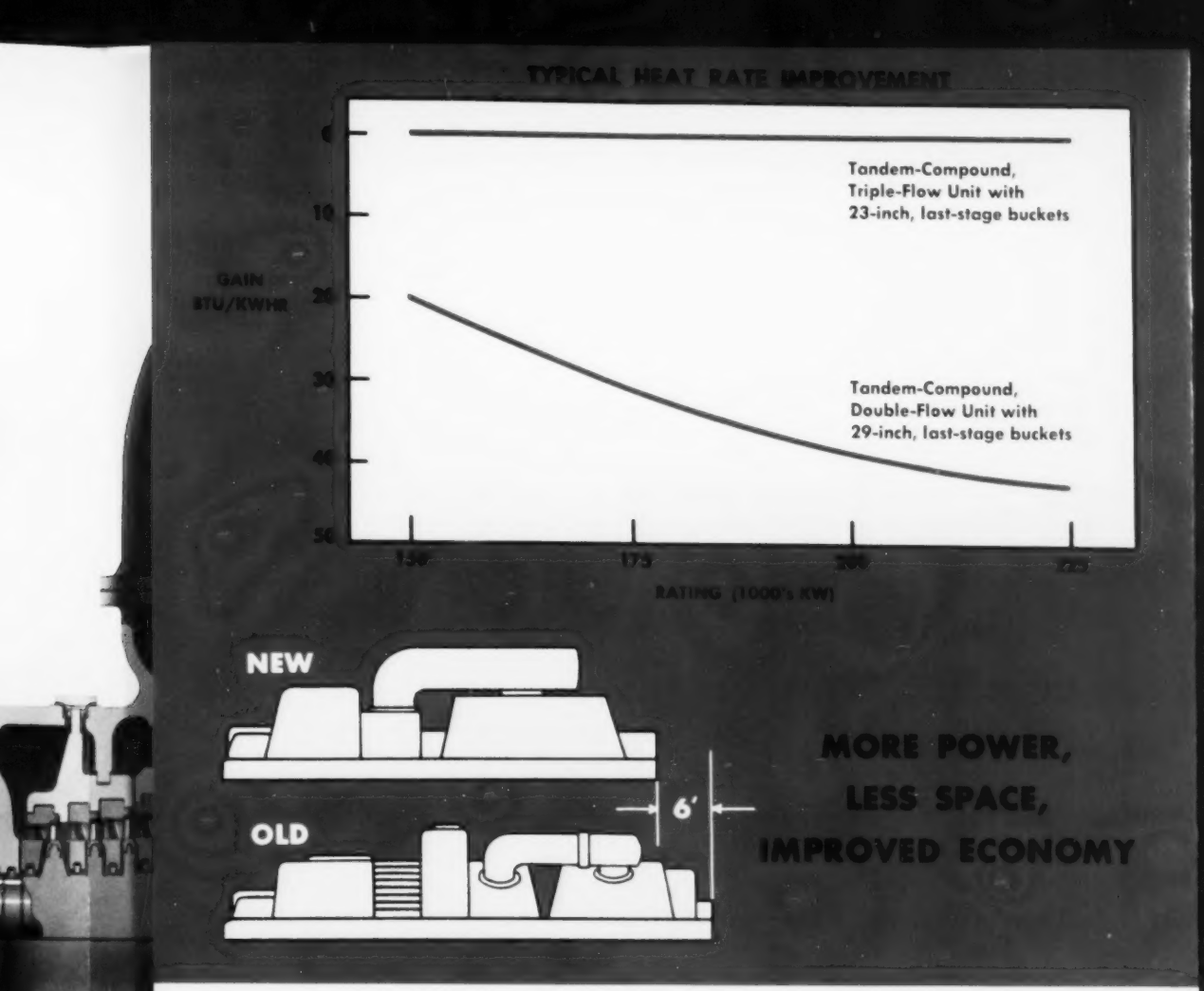
JOHNS-MANVILLE JM PRODUCTS

For phone number of closest representative see advertising index in back of book.

NEW BUCKET DESIGN
for steam turbines . . .
increases ratings, simplifies arrangements
The new 29-inch, last-stage bucket makes possible a further advancement in turbine design—the capacity of General Electric's well-established 3600-rpm, tandem-compound, double-flow, reheat steam turbine can now be raised to the 175,000—225,000-kw range. This new concept in bucket design helps improve turbine heat rate and increases power without increasing turbine size or complexity. Inherent G-E bucket standards—high-efficiency, low-vibration characteristics, and long-life qualities—are maintained.
Characteristics of the advance are:
• increased annulus area over the previously longest 3600-rpm last-stage bucket;
• efficient aerodynamic profile;
• rugged, nested pin-and-finger dovetail construction; and
• improved bucket material.
Continuous new developments, such as this bucket design, are making it possible for General Electric to pre-engineer steam turbines for the '60's. On the following pages are more design features that help improve heat rate, increase reliability, and extend ratings of the time-proven power maker—the tandem-compound, double-flow, reheat steam turbine.
GENERAL ELECTRIC




STEAM-FLOW



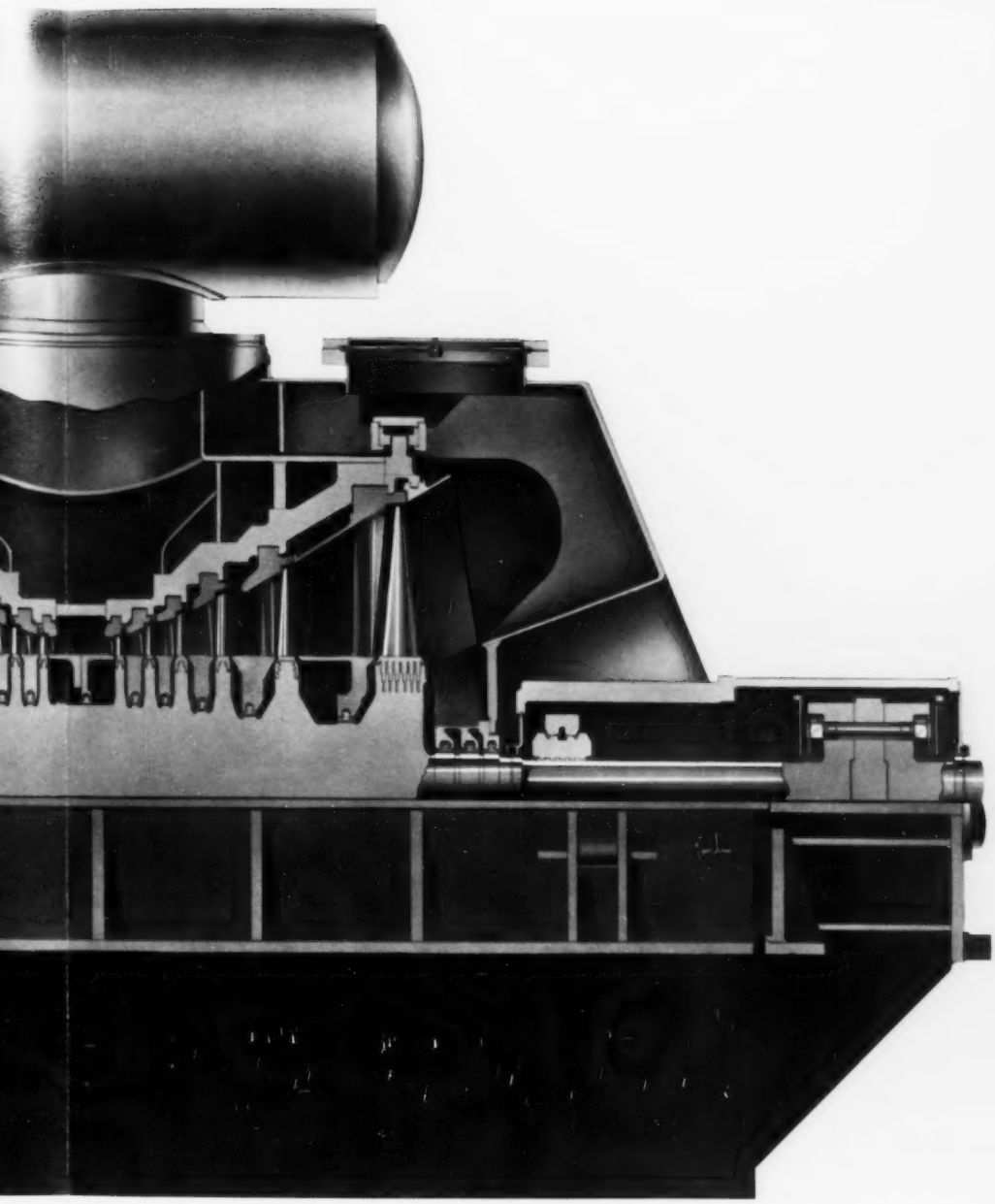
Simplified Design Helps Improve Turbine Economy for the '60's

Inherent simplicity and ruggedness of construction have helped establish the basic double-flow design as a standard concept. Now General Electric's newly designed 3600-rpm, tandem-compound, double-flow, reheat steam turbine, with 29-inch, last-stage buckets – in addition to being more compact with improved heat rate – is adding emphasis to:

- **Smoother operation**—two bearings per rotor span allowing independent balancing, vibration isolation between spans, and shorter front standard;
- **Reliability**—intercept valves close to reheat inlets for controlled overspeed, thrust bearing in middle bearing housing for better balance of bucket-to-nozzle clearances;
- **Accessibility**—one-piece lower and upper half-shell construction, single crossover;
- **Ease of assembly and disassembly**—one less turbine rotor, one less cast steel shell, fewer bearings, packings, and couplings.

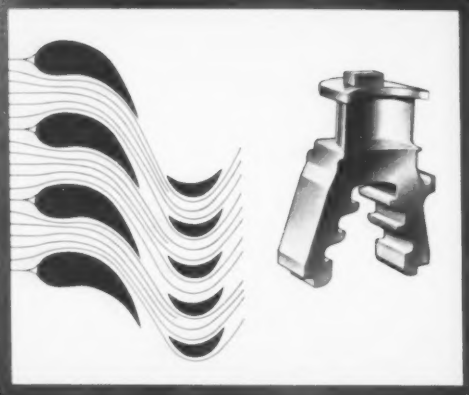
This is another of General Electric's pre-engineered turbines for the '60's – turbines which can help you meet ever-increasing power demands. For more information on any of General Electric's large steam turbine-generators, contact your nearest General Electric Apparatus Sales Office. 254-78

GENERAL ELECTRIC

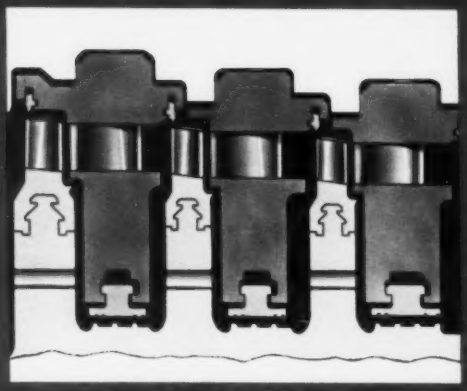


3600-rpm, tandem-compound,
double-flow, reheat steam turbine

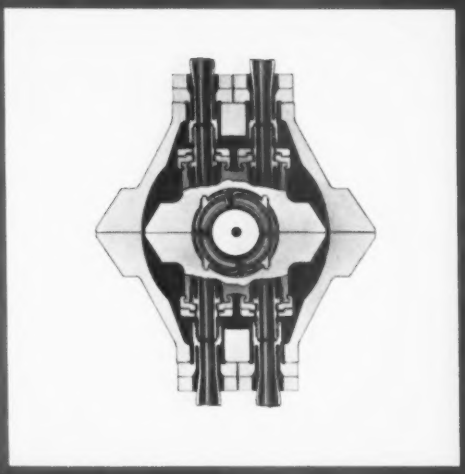
GENERAL ELECTRIC



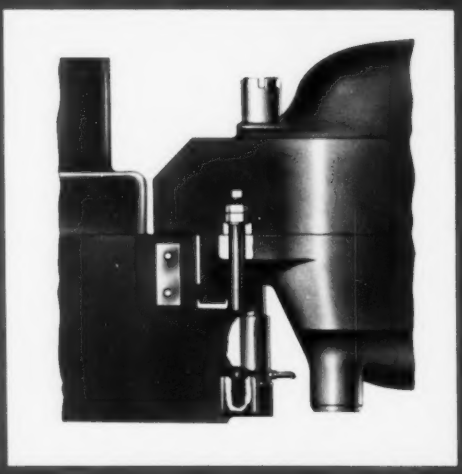
IMPULSE-TYPE STEAM PATH,
RUGGED BUCKET DESIGNS



REMOVABLE RADIAL SPILL STRIPS,
SPRING-BACKED SHAFT PACKING



NOZZLE BOX CONSTRUCTION



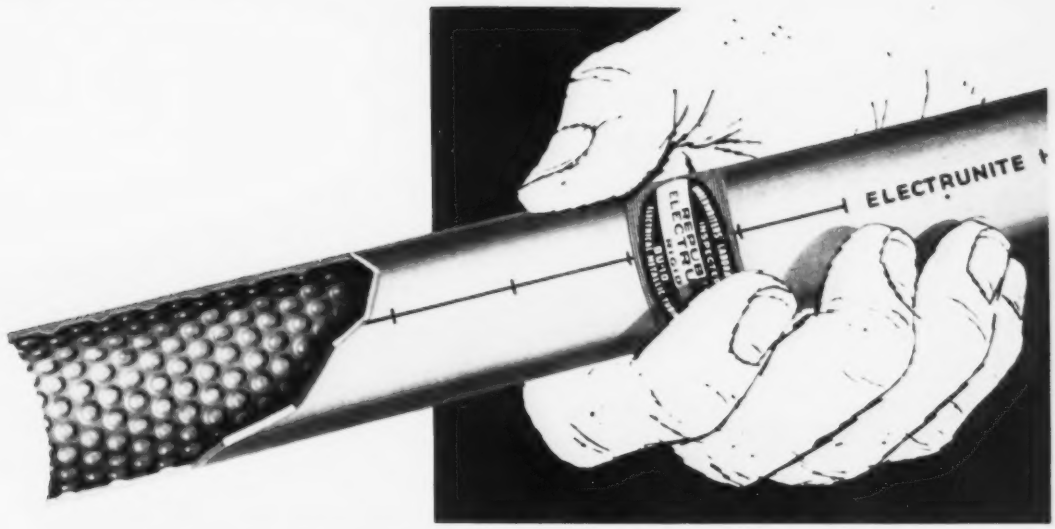
TRUE CENTER-LINE SUPPORT

These Important Evaluation Features of General Electric Pre-engineered Steam Turbines Mean...

- Minimized Investment
- Improved Performance
- Simplified Operation
- Greater Reliability
- Increased Availability
- Accelerated Installation
- Reduced Maintenance
- Extended Life

Progress Is Our Most Important Product

GENERAL ELECTRIC



Republic ELECTRUNITE E.M.T. with SILVERSLICK
...wire pulling up to 37% EASIER...wire pushing easier, too

NOW...THE BEST COSTS EVEN LESS INSTALLED

SILVERSLICK is quick! New, improved Republic ELECTRUNITE® E.M.T. with SILVERSLICK inside finish makes wire pulling up to 37% easier. Wire pushing is even easier.

SILVERSLICK—the SILVER-colored, SLICK inside finish developed by Republic—combines with ELECTRUNITE's exclusive "INSIDE-KNURLING" to offer you greater installation advantages and economies.

SILVERSLICK helps wires slip smoothly, easily through the tube and roll over the knurling. Because contact surface and friction are reduced, wire pulling, wire pushing are easier.

In the laboratory, in the field, on the job . . . you've never had it so slick!

ELECTRUNITE works slick in concrete installations, too. ELECTRUNITE's tightly adhering galvanized coating protects against corrosion. It won't chip, or flake off during bending. No threading is required. Uniform concentricity assures snug fit of couplings and connectors—shutting out moisture and concrete.

Republic ELECTRUNITE E.M.T. offers complete wiring protection. It is approved in the National Electrical Code, is produced to A.S.A. Specification C80.3, and Federal Specification WW-T-806, latest revisions. ELECTRUNITE E.M.T. carries the Underwriters' Laboratories Seal of Inspection.

To learn more about the installation advantages and economies of Republic ELECTRUNITE E.M.T., call your electrical distributor. Or, send coupon today.

Try this DEMONSTRATION...

Take a sample length of Republic ELECTRUNITE E.M.T. with new SILVERSLICK inside finish. Insert a bundle of 25 pipe cleaners. Now, push-pull the pipe cleaners through the tubing. Depending on the type of wire coating, as many as three

Number 12's can easily be pushed through a 20-foot run of ½" Republic ELECTRUNITE E.M.T. with four right-angle bends. Ask your electrical distributor sales representative to show you samples with this new inside finish.

REPUBLIC STEEL
STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-6889-B
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Please send additional information on the following:
☐ Republic ELECTRUNITE E.M.T. with SILVERSLICK Finish
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Name_____ Title_____
Company_____
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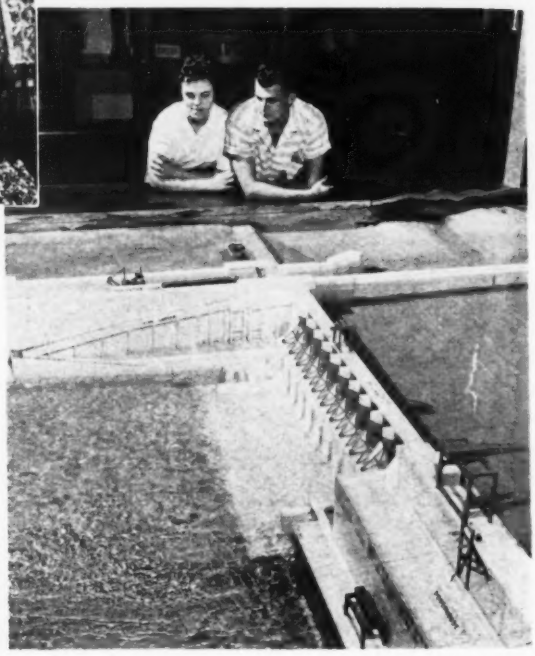
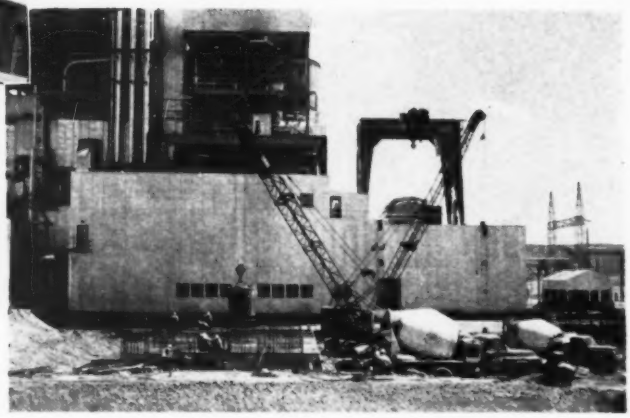
news

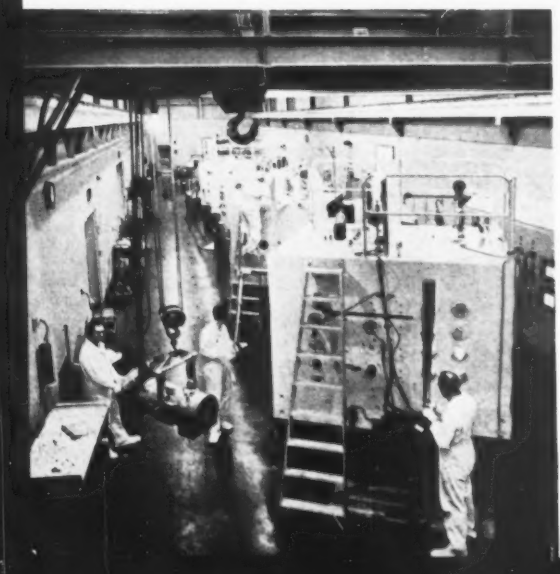
Portlanders chuckled when this "Leave Better Electrically" float of Portland General Electric Co. appeared at the Rose Festival. Also in the Northwest was the Oregon Centennial Exposition, and the Corps of Engineers was represented with the hydroelectric model shown at right. It was one of several electrical exhibits at that show



Arthur Rolander, General Atomics, E. R. de Luccia, Don McClung and Dr. J. B. Ward, Pacific Power, and Dr. R. H. Stahl, GA, at GA laboratory dedication



Concrete footings and foundation work for the boiler structure are shown as the second 100,000-kw generating unit for Dave Johnston plant near Glenrock, Wyo., takes shape. The unit is scheduled for completion in October 1960, at a cost of about $16,525,000. The two units will have increased Wyoming's power supply by 65%



A one-ton stainless steel transfer cask is used by General Electric technicians to transport radioactive materials inside the Hanford radiometallurgy laboratory. The cask is suspended from a moving overhead crane. Materials under study, which have been irradiated in Hanford reactors, are disassembled and examined remotely

Management

Bonneville Tie

At a meeting of the governors of California, Oregon and Washington in Sacramento, California Gov. E. G. Brown stated a preference for a Bonneville-California power line owned by government agency or agencies. Oregon and Washington governors did not commit themselves on this point. The governors agreed that they would participate in the formulation and direction of economic and engineering studies now being contemplated by Bonneville and other federal and private groups. In addition, to implement this the California Legislature has voted $70,000 for study purposes. In addition, California has indicated its willingness not to claim status as a preference customer of the Bonneville Power Administration in competition with Northwest power users.

Subsequently, officials of Bonneville, Bureau of Reclamation, FPC, the governors of Oregon, Washington, Montana, California, and other interested public and private utility groups in the group agreed on basic assumptions and a schedule of timing as follows:

Sept. 1—Power loads and resources through 1985 for Pacific Northwest, northern California, California Oregon Power Co., southern California and British Columbia.

Sept. 15—Coordination of BPA's system with the Central Valley Project (Calif.) including available secondary power study.

Oct. 15—National defense aspects.

Oct. 15—Transmission interconnection alternatives on the basis of delivery of salable energy, coordination of federal systems, alternative voltages and costs.

Sept. 1 to Oct. 15—Several reports dealing with consideration of construction of fuel requirements in California, effects of geographical extension of BPA's service area and total investment costs.

Nov. 15—Deadline for preliminary draft of the entire study.

Dec. 15—Final report with comments presented to group as a whole.

Dec. 30—Presentation to the Senate committee.

► Utah Power & Light and its subsidiary Telluride Power Co. have been authorized by the Utah Public Service Commission to liberalize line extension policies. UP&L will increase from $150 to $400 the amount it will spend to extend its service to permanent, nonseasonal customers without their financial participation or guarantee. Telluride will also raise its limit to $400.

► The Portland Chamber of Commerce has affirmed a resolution that will seek amendment of the preference provisions of the Bonneville Power Act to assure that power customers in preponderantly private power Oregon will share equitably with other consumers in the Northwest. The chamber said it was deeply concerned with the problem of an adequate and long-term supply of competitively priced electric energy and that Oregon consumers should not be expected to accept and endure indefinitely the discrimination imposed by the preference provisions of the Bonneville Project Act.

► The General Electric Co., well known for its public stands on important political issue, has sent its 39,000 Western share owners a special news letter urging them to action against inflationary government spending. The mailing encourages share owners as individual citizens to urge their congressmen to adopt "make-sense" attitudes toward measures which may feed inflation's fires.

► The Douglas County PUD, in an effort to combat inflation and keep power rates low, has adopted an even-dollar billing system for utility customers.

NEWS INDEX

Association Affairs	130
Growth	108
Management	107
Manufacturers-Distributors	111
Market Development	123
People	126

Valuation Increases

The true cash value of electric utilities operating in Oregon increased 17.9% from 1958 to 1959 according to the annual review of utility assessments of the Oregon State Tax Commission. The cash value of Oregon electric utility properties is now $485 million.

Public utilities in the State of Washington were valued at $921 million by the State Tax Commission for tax protests. Largest boost in valuation was for Puget Sound Power & Light Co., the commission placing a value of $126 million on the company, an increase of $29.6 million over 1958. Other heavy increases were listed by Pacific Power & Light Co., which went up $29 million from $97 million. Washington Water Power's evaluation was up $2.5 million to $59 million.

Downstream Benefits

Witnesses from both public and private power in the Northwest joined the FPC in Washington to urge legislative approval for federal payment to nonfederal projects for increased power potential at federal dams elsewhere on the stream. The group contended, "Under the coordinated operation contemplated by the legislation, all parties would be assured of a firm base supply of power and storage releases would be timed for optimum benefit."

► The three largest private power companies operating in Washington state have requested rate increases from the Washington State Public Service Commission. General rate increases of 10% are sought by WWP and PP&L while Puget Power is seeking an 11% increase. The increases sought by Pacific Power and Puget Power will be the first in the companies' history. Washington Water Power has received only one general rate boost in 70 years.

► Pacific Gas and Electric Co. has asked the Federal Power Commission to deny a $4.5 million natural gas price increase requested by Phil-

lips Petroleum Co. of Bartlesville, Okla., because such an increase ultimately would raise costs to California consumers.

PG and E filed objections to a recommendation by an FPC examiner that Phillips, a gas producer, be allowed to increase its gas prices to El Paso Natural Gas Co., which supplies about 70% of the natural gas distributed by PG and E to its customers in northern and central California. In 1958 PG and E purchased $80 million worth of gas from El Paso—about 40% of El Paso's interstate sales.

► BPA officials were glad to see a truce reached in the threatened aluminum strike. A shutdown of all eight aluminum reduction plants in the BPA area would have meant a monthly revenue loss to BPA of more than $1.6 million.

► The Dalles Dam dedication has been scheduled for Sept. 26. Work is busily going ahead on parking areas, television equipment, platform, etc., in hopes that President Eisenhower will be on hand for the ceremony.

► The California Fish and Game Commission has reached agreement with the California Oregon Power Co. regarding construction of a re-regulating dam on the Klamath River. The agreement points to a settlement of negotiations and court actions that have taken place over a period of years.

► Grant County PUD has appointed the Peoples Bank of Washington, in Seattle, as trustee of the $195 million fund for Wanapum hydroelectric development. As trustee, the Peoples Bank will invest the money in the construction fund in federal obligations applying interest to the construction fund. They will also pay off cost of construction from the fund.

► An FPC examiner held a hearing in Spokane Aug. 17 on the conflicting applications of Seattle City Light and the Pend Oreille County PUD to determine which utility will have the green light for dam construction on a stretch of the Pend Oreille River in northeastern Washington.

Strongly opposed to both proposals is the Northwest Mining Assn., fearing that construction of the dams will bring great damage to nearby mining operations.

► Electric customers in Oregon pay an average of 1.27¢ per kwh, exactly half the national average according to the Oregon Public Utilities Commission. Private power supplies 48% of the Oregon consumers.

► El Paso Electric Co. of El Paso, Tex., has been authorized by FPC to issue 50,000 shares of $5 par value common stock. The stock will be issued, in accordance with the provisions of the company's employee stock purchase plan, at various dates after January 1, 1960. Proceeds from the sale, estimated at approximately $1,360,000, will be applied toward the cost of additions to the company's utility properties.

Growth

Agua Fria No. 3

Construction on a $22 million addition to Salt River Project's Agua Fria electric power generating plant near Glendale, Ariz., is scheduled to start Oct. 1.

The Los Angeles office of Bechtel Corp. will be in charge of construction.

When the plant is put in service May 1961, the project will have a capacity of 395,000 kw at the Agua Fria site. Investments in the plant will total more than $45 million.

Reprocessing Plant

General Electric Co. has started design of a $6 million facility for reprocessing power reactor fuel elements. The plant, to be located at Hanford, Wash., will reprocess from 50 to 150 tons a year of highly diversified, low-enrichment fuel.

The reprocessing of special reactor fuels at Hanford will allow further application of technology and production skills for chemical separation of reactor fuel elements.

► The Skagit River was diverted from its original course to a new man-made channel to permit excavation for second-stage construction of Seattle City Light's high Gorge Dam. The channel was constructed in accordance with designs tested last year at the hydraulic laboratory at the University of Washington. When completed in 1961 the additional 88 ft of head provided by the dam and modernization of generators will increase the capacity of the plant by 57,000 kw.

Progress Report

Chelan County PUD's Rocky Reach Dam—55% complete. First power May 1961.

Grant County PUD's Priest Rapids Dam—80% complete. First power September or October of this year.

San Diego Gas and Electric Co.'s new South Bay plant well ahead of schedule on the first 136,500-kw units. First power planned for July 1, 1960. Ultimate plant capacity eight units, some larger than the first.

► Sacramento MUD board of directors has awarded a contract to Peter Kiewit & Sons for the construction of the Upper American River project Union Valley Dam. Proposed ultimate development of the Upper American project will produce 487,000 kw.

► Utah Power and Light Co. has broken ground 13 miles north of Kemmerer, Wyo., signaling the start of the company's $34 million, 150,000-kw steam-electric project. The plant will utilize strip-mined coal—will go on the line in the fall of 1963.

► The U. S. Department of the Interior has ordered from the Allis-Chalmers Mfg. Co. the 17th and last 100,000-kva generators for Hoover Dam. In place, the generator will raise the plant capacity to 1,344,800 kw.

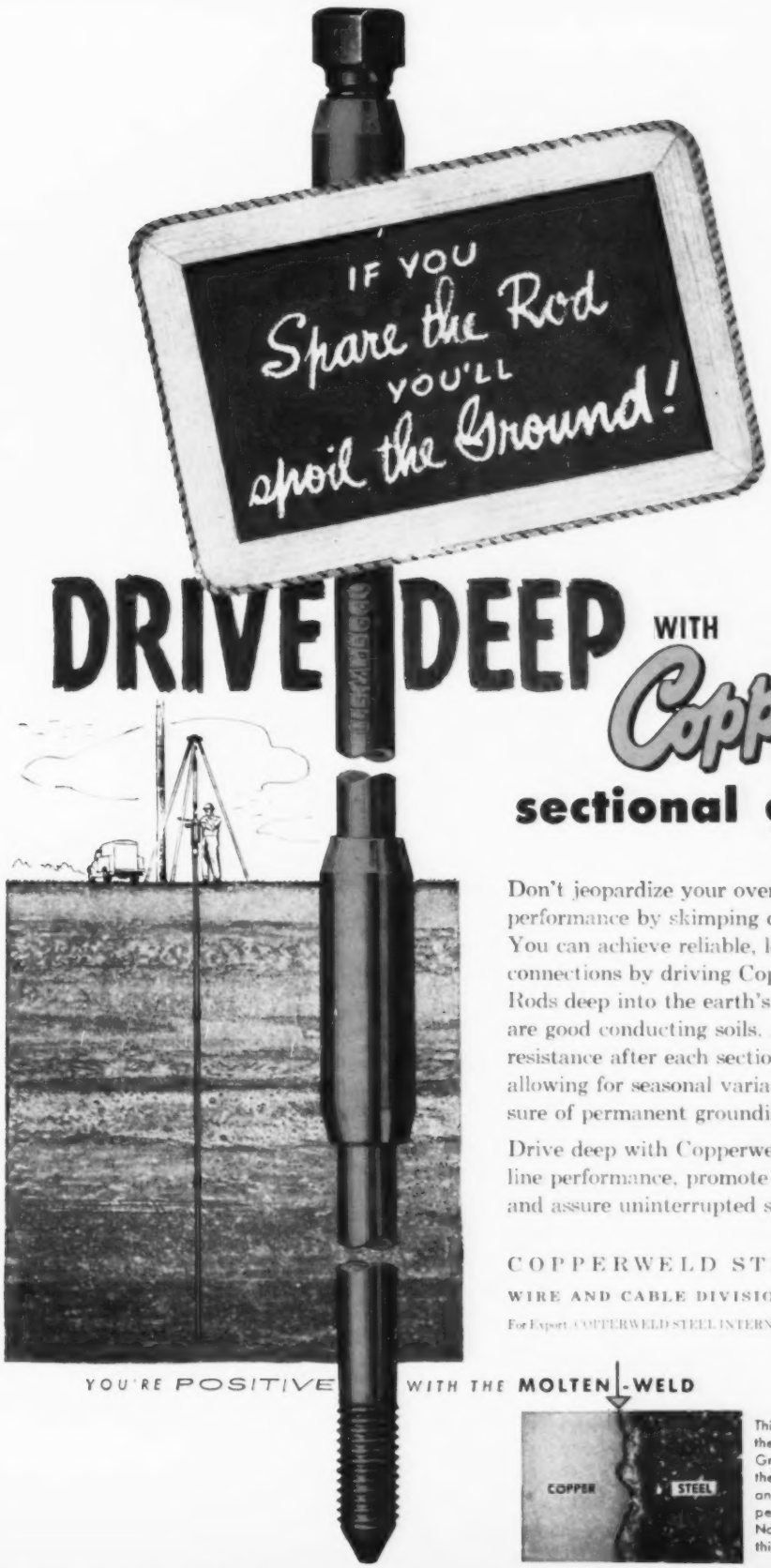
► City of Sitka, Alaska, has under consideration bids for a $5 million hydroelectric project.

► A contract has been let to construct 83 miles of transmission and distribution lines that will provide Fish Lake Valley in Esmeralda County, Nev., with its first electric power service.

The project will serve 143 rural consumers in Esmeralda County and also in Inyo and Mono Counties in California.

White Mountain Power Cooperative of Fish Lake Valley is in charge of the project.

► Washington Water Power has announced plans to build a $530,000 power line from Grangeville, Idaho, to Elk City, Idaho. Construction of the 66-mile project will start this fall. Elk City, a former gold rush town in Idaho's early history, has a population of 275. Population of the town has increased in recent years because of expansion in its sawmill industries.



DRIVE DEEP WITH Copperweld®

sectional ground rods

Don't jeopardize your overhead line performance by skimping on ground rods. You can achieve reliable, low-resistance ground connections by driving Copperweld Sectional Ground Rods deep into the earth's sub-surface where there are good conducting soils. And by measuring resistance after each sectional rod is driven—allowing for seasonal variation—you can make sure of permanent grounding protection.

Drive deep with Copperweld! You'll improve line performance, promote safety, avoid damage, and assure uninterrupted service.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

YOU'RE POSITIVE WITH THE MOLTEN-WELD

This microphotograph of the weld area of Copperweld Ground Rods shows how the grains of copper and steel alloy to form a permanent, continuous weld. No other process achieves this inseparable union.

For phone number of closest representative see advertising index in back of book.

Quick...Easy...Sure

STRIP back cable insulation... arrows on INSULINK show how far.

INSERT wire ends; **caps grip and hold cable,** both hands are free for crimping.

CRIMP with standard compression tool... guide lines on **INSULINK** show where.

Pre-insulated

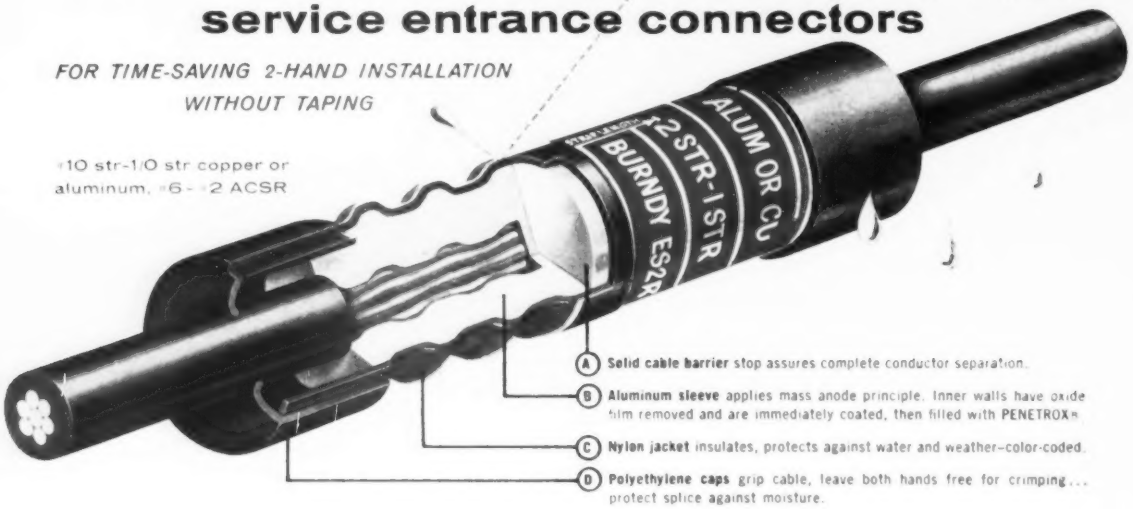
INSULINK®

Patented ... Other Patents Pending

service entrance connectors

FOR TIME-SAVING 2-HAND INSTALLATION WITHOUT TAPING

#10 str-1/0 str copper or aluminum, #6-#2 ACSR



(A) **Solid cable barrier** stop assures complete conductor separation.

(B) **Aluminum sleeve** applies mass anode principle. Inner walls have oxide film removed and are immediately coated, then filled with **PENETROX®**.

(C) **Nylon jacket** insulates, protects against water and weather—color-coded.

(D) **Polyethylene caps** grip cable, leave both hands free for crimping... protect splice against moisture.

Connect service entrances with much less effort, in less time, **without taping.** INSULINK pre-insulated compression connectors are installed in three simple steps with the same crimping tools and dies used to install uninsulated connectors...for time-saving economy...for neat, fully protected, electrically stable connections. INSULINK connections are

QUICK: because there's no taping.

EASY: color-coded connector jacket clearly marked to show cable ranges, strip length, where to crimp. Just strip...insert...crimp; caps hold cable ends in place for simple two-hand installation.

SAFE: fully insulated to protect personnel; protected against water and weather; neat, attractive appearance.

Get the full story on **INSULINK** pre-insulated connectors from

BURNDY

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In Europe: Antwerp, Belgium **Toronto, Canada**

For phone number of closest representative see advertising index in back of book.

Manufacturers—Distributors

In front of fixture spray booth—Leo Hansen, R. C. Hamberger, W. R. Davies and Saul Levi of Westinghouse lamp, fixture, lighting and distribution service

Westinghouse Opens New Facility in West

To serve some five or more of the many functions of Westinghouse Electric Corp. for the West, a new 177,280 sq ft building on a 16½-acre plot in San Lorenzo was opened officially Aug. 3 by Vice-president Walter Maytham. The large facility has been in operation and "shake-down," however, since April and when officially dedicated was in full running order.

The large building has extensive warehousing facilities for Westinghouse major appliances, TV receivers and high-fidelity sets for the northern California and Nevada market. It also houses the offices for the Westinghouse Appliance Division for that area. The second function is that of housing headquarters for the Western states for the Lighting Division and for the first time a lighting fixture assembly plant to serve the Western market. The third function is that of headquarters for the Lamp Division for the Western area and a warehouse for the lamp stock.

Also housed here is the center for the order-processing teletype computer system to serve all Westinghouse apparatus offices and warehouses in the Pacific Coast region. The RAMAC system can check whether an item is in stock and where it is, revise the inventory balance, type and complete the invoice and shipping papers, and do the necessary record keeping for such billings.

An auditorium is provided for display of appliances and lighting equipment and for the holding of sales meetings, service classes, etc. The appliance and TV "back-up" service center for the company's dealers is also located here.

The building is heated and cooled by Westinghouse's own reverse cycle system and the lighting is up to highest standards, using the latest models of the company's lighting fixtures. The assembly plant takes the metal punchings and components received by rail and forms them into fixtures. Street lighting fixtures are also assembled here.

Executive personnel who make their headquarters here include: Saul C. Levi, manager of the San Francisco Bay area distribution center; Joseph C. Belloni, Pacific Coast manager of distribution services; William R. Davies, manager of the West Coast Lighting Division and plant; George B. Mackey, regional manager of the Lamp Division; John Murray, manager of the RAMAC department; Walter L. Baker, area manager, consumer products; Robert E. Savre, regional manager, portable appliances; T. Bert Newby, northern California district manager, appliance sales.

G-E Division Starts New Denver Quarters

Construction has started on a three-story office building for headquarters of General Electric's Rocky Mountain District Apparatus Sales Division.

The structure is in the Cherry Creek area near University Boulevard in southeast Denver. It will have 40,000 sq ft of floor space.

G-E's apparatus sales division offices have been in the Security Building in downtown Denver since 1927. The move to the new quarters is slated for the spring of 1960.

The building is being erected by N. G. Petry Construction Co.

► Members of the **Bruce-Emmett** Co. staff visiting the Cavalier plant in Chattanooga, Tenn., recently include: B. V. Mumford, Tom Emmett and Allen Herr, Portland; Max White, Salt Lake City; Stewart Holmes, Spokane. The company distributes Cavalier heaters in Washington, Oregon, Idaho, Montana and Utah; maintains warehouse stocks in Portland.

Shelley

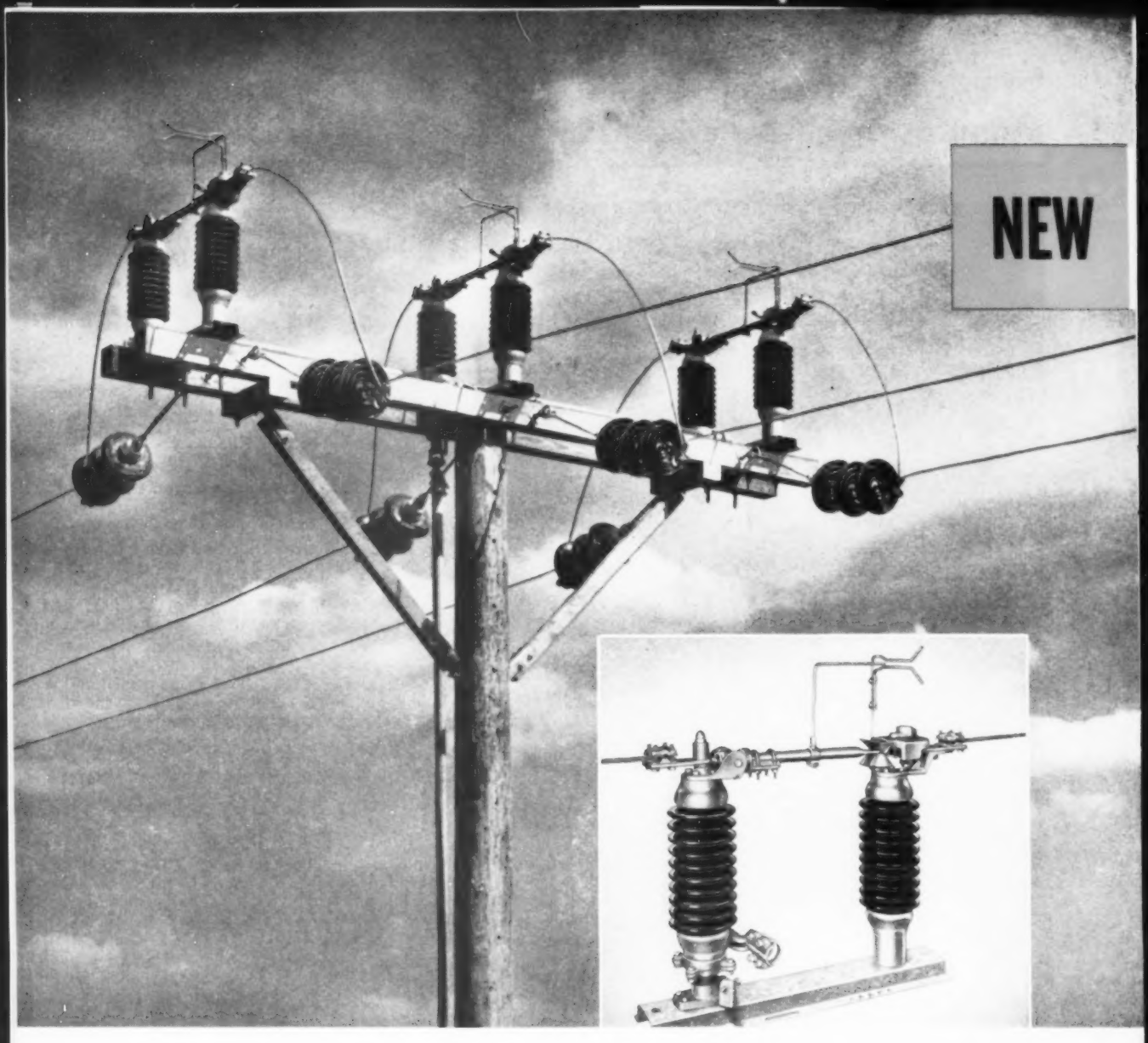
Lemman

Federal Pacific Appoints Two on West Coast

Leonard P. Shelley has been appointed manager of Federal Pacific Electric Co.'s Pacific Switchgear Division, it was announced by Frank L. Roby, executive vice-president. At the same time, Robert L. Lemman was named manager of the company's North Pacific sales region.

A vice-president of Federal Pacific since 1957, Shelley has been serving as acting divisional manager for the past five months. An engineering graduate of the University of Michigan, he joined Federal Pacific in 1918 as Los Angeles district manager, becoming Western regional manager in 1950. Previously he was associated with Wright Aeronautical Corp., Sperry Products Inc. and Solar Aircraft Inc., and has served as an officer with the Naval Bureau of Aeronautics.

Before joining Federal Pacific,



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney *Self-Aligning* side-break switches to be installed faster and more economically than other types.

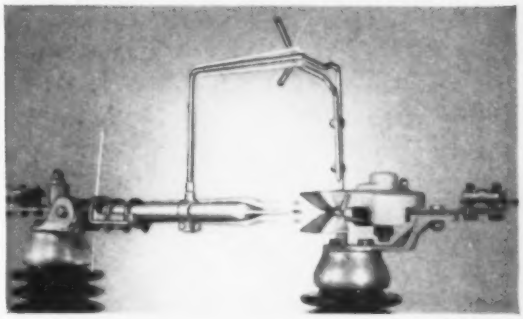
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

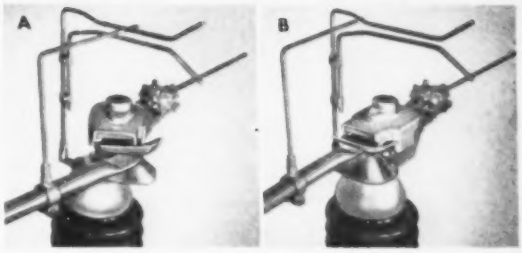
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

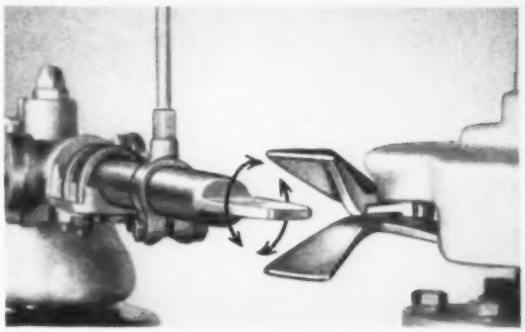
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical $1\frac{1}{4}$" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

JAMES R. KEARNEY CORPORATION
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IN THE WEST: for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
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397

FOR BETTER CONSTRUCTION... SAFER MAINTENANCE

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Plants at: **ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA**

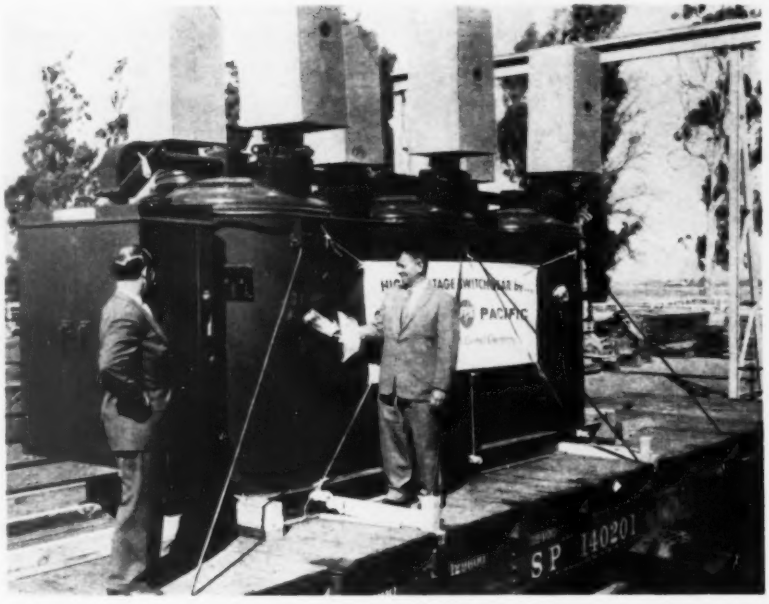
Lemman spent six years with Line Material Industries where he was responsible for sales and promotion of utility apparatus in the states of Washington, Oregon, Idaho and Alaska. Previously, he worked for Allis-Chalmers in Seattle.

Headquarters of the Switchgear Division are in Santa Clara. The North Pacific sales region is headquartered in Seattle.

► **Allis-Chalmers** will visit 100 major cities with its ControlLiner, a tractor trailer unit showing the low and high voltage motor control line. Some 800 customer contacts will be visited on the tour.

► **Ohio Brass** has opened a "million-dollar-plus" facility to mechanize manufacture of the new Futura suspension insulator series. These insulators, featuring a corrosion intercepting sleeve and incorporating improved methods of loading porcelain, were announced in August.

► **Deutsch** Co. will open its air-conditioned electrical connector plant at Banning, Calif., on Sept. 4, according to Robert Cumins, vice-president. A feature of the 35,000-sq-ft plant is its location adjacent to the airport with a taxiway direct to the entrance.



First oil circuit breaker shipped from Federal Pacific Electric's new Santa Clara, Calif., plant is christened by E. C. Schott, Santa Clara city engineer, while L. P. Shelley, FPE vice-president and Pacific Switchgear Division manager, looks on. The 115-kv unit will go to Pacific Power & Light Co. for its Wyoming system. Federal Pacific has just completed a seven-year program to consolidate at Santa Clara activities of its switchgear division, previously operating from three plants in the San Francisco area

More than $25 million will be spent at Westinghouse plants to expand and modernize manufacturing facilities. The program, which looks toward peak loads during the 1962-64 period, includes more than $1 million to boost steam turbine capacity at Sunnyvale, Calif. Shown here is a miniature 3-D plant using more than 1,000 scale model machines and turbine components—a valuable tool in planning rearrangement and modernization. The model represents about 1½ million sq ft of floor space

► **Western Lighting** Corp., Los Angeles fluorescent lighting manufacturer, held a Western states sales meeting recently. Speakers included: Robert Clubley, G-E Lamp Department; Arthur Rowe, G-E Ballast Department; Paul Davis, Corning Glass Works; Frank Evans, Plastic Specialties Co. Representatives from Tacoma, Portland, Salt Lake, Phoenix and San Francisco joined the southern California sales force for the meeting. Milt Weiner, Western sales manager, reports that the next regional sales meeting will be at Coronado, Calif.

► **A patent dispute** on appliance and air conditioning products has been settled by General Electric and Hupp Corp. Hupp has received a royalty free license to use 16 G-E patents, plus a cash consideration, in exchange for which G-E was granted a nonexclusive paid-up license to use a Hupp patent for fractional horsepower compressors.

► **Hill & Dietrick** of Oakland, Calif., has opened a new office in Los Angeles at 5525 Wilshire Blvd. The company, which represents manufacturers in 11 Western states, has office and warehousing facilities at 417 E. 10th St., Oakland 6. Headquarters address is P. O. Box 627, Oakland 4.

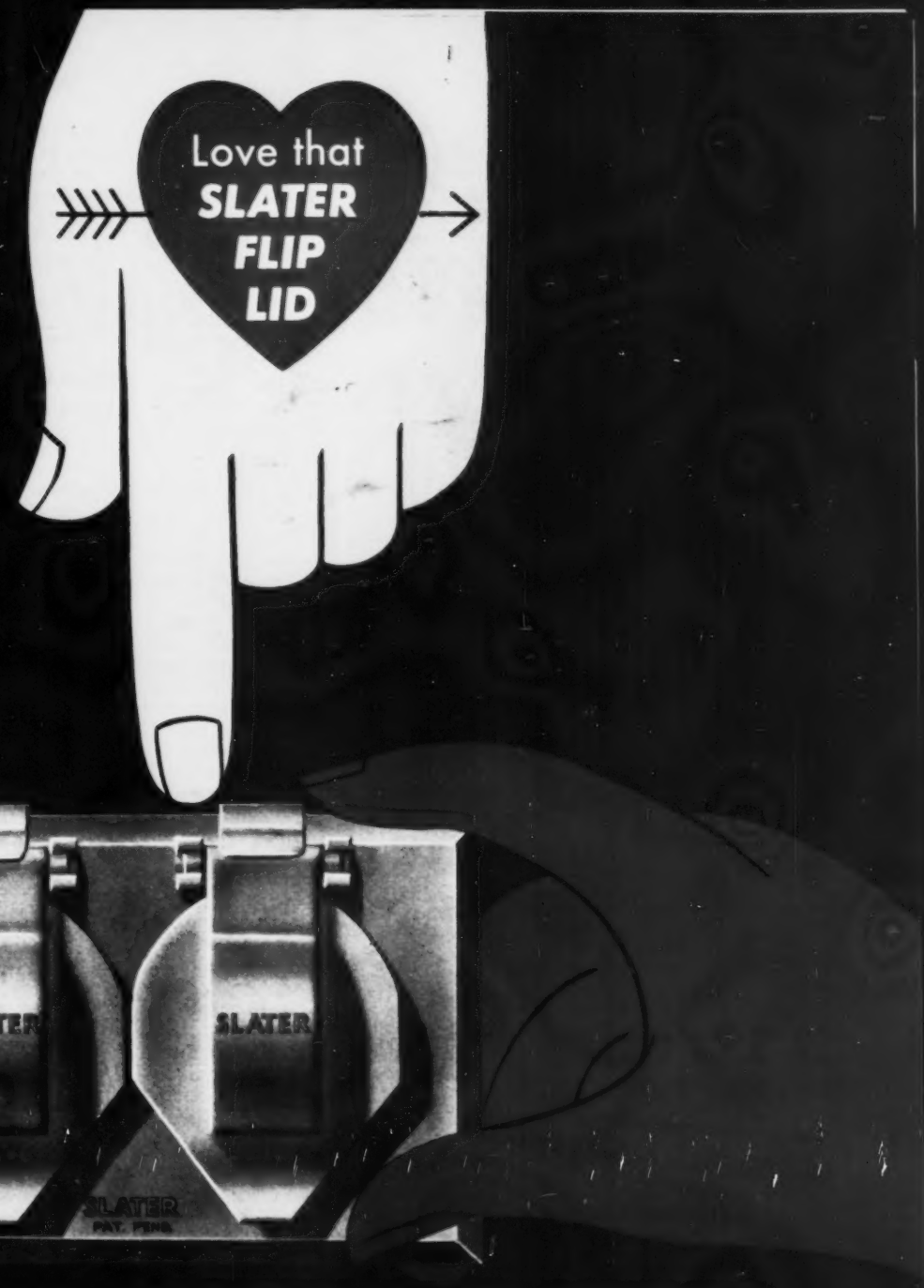
► Waste King Corp. has appointed Clark Stephens as development engineer at Downey, Calif.

► Jim Tallant succeeds J. M. Chadband as Boise branch manager for G-E's major appliance and TV sales and distribution division. Chadband resigned to start his own retail appliance operation in Pocatello, Idaho.

► Kelvinator has opened a direct factory to dealer office and warehouse at 1108 Main, Boise. Dell L. Thornley, Intermountain zone manager, announced. A. H. Roland will head the operation.

► Dailey Electric Co. of Phoenix recently sold its motor and transformer repair business to Westinghouse Electric Corp., according to J. Ray Horton, president. It also includes the light electronics manufacturing business. Horton continues to operate a construction and sales business under the name of Dailey Electric Sales Co., which represents Moloney Transformers, Delta-Star, Sterling Motors and Essex Wire.

► **R. Graham Holabird** has joined the staff of Biddle Trade Publishing Co., Los Angeles, to become vice-president and assistant to Presi-



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Name Your Size and Length
...We Ship Today!

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Iron-clad guarantee of quality!
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dent A. H. Gudie. Holabird was for many years with National Electric Products and its assistant vice-president. He recently joined All-Brite Fluorescent Fixtures and was with that company until it merged with Curtis Lighting.

► **Robert J. Wyllie** has been appointed advertising and sales promotion manager of Federal Pacific Electric Co., it was announced by Robert L. Bobo, the company's vice-president-marketing. Wyllie was previously employed by General Electric Co. at Schenectady, where he served as an advertising planner, in charge of advertising and sales promotion for the company's lines of utility, industrial, farm and atomic motors and generators. He joined General Electric in 1953 as an advertising specialist.

Wyllie

► **Donald E. Ingalls** is now representing Jasper Blackburn Corp. in northern California and Nevada, Ken Ray, vice-president of sales, has announced. He will have office and warehouse facilities at the Sales Mart, 1485 Bayshore Blvd., San Francisco. The only other line he is representing is Lapp Insulator Co. His appointment by Blackburn was effective Aug. 1.

Ingalls

Smoot-Holman Changes Setup

Organization changes made by Smoot-Holman Co. Inc. of Inglewood were announced by Leonard Hobbs, vice-president, at a recent stockholders meeting. C. E. Smoot and George Holman, founders of the company, resigned their posts. C. E. Smoot had been president for many years and George Holman executive vice-president. He now becomes a director.

The new officers are W. G. Holman, president; Leonard Hobbs, vice-president; Fred Smoot, secretary-treasurer; C. E. Smoot Jr., director, taking his father's place. George Holman made the first porcelain-enameled reflector and C. E. Smoot had the first porcelain-enameling plant in the Los Angeles area.

In the San Francisco area, Hobbs announced that Charles Blakely, who had been sales manager, resigned recently to join San Francisco Lighting as its sales manager and Al Elufson has been appointed as sales manager for the San Francisco area.

Distributor Meeting Draws 200

A big meeting for all salesmen, sales managers and general managers of electric supply distributors in the Los Angeles area was staged recently at Rodger Young Auditorium. The meeting was arranged by E. E. Karsten, Gough Industries, who acted as master of ceremonies, and an industry-wide committee.

It was attended by 200 who heard NAED Executive Director Arthur Hooper's paper "Let's Make Some Money—Here's How," which was read and accompanied by a slide presentation given by Ken Rehwaldt of G-E Supply.

Stanley Johns of Electric Corp. followed with a talk to salesmen "Overcoming Our Price Consciousness." The session began with a lead-off talk by A. H. "Bill" Gudie, Biddle Trade Publishing Co., "What's Wrong With the Electrical Wholesale Business."

► **George Eicher**, aquatic biologist for Portland General Electric Co., has been retained by **Clair A. Hill and Associates** of Redding, Calif., to consult on a fish protection program for the Iron Canyon project of the Glenn-Colusa Irrigation District. He also will act as consultant for **Bechtel** in conjunction with the Wells project on the Columbia River.

► **W. M. Dusenberry** will represent **RT&E** Corp. in the southwest. He had been with Line Material Industries.

► **Tom Guidry** has joined **Bill Hagen** as sales representative for **Zinsco** Electrical Products in the Sacramento area. The company has moved into new quarters at 7500 14th Ave.

► **Pacific Electric Sales Co.**, 140 S. E. 28th Ave., Portland, has been appointed manufacturer's representative for Connecticut Cord & Cable Co., Guilford, Conn., manufacturer of a full line of electrical cord. A warehouse stock will be maintained in Portland.

Westinghouse Moves Portland Office

When Westinghouse Electric Corp. moves into its new Portland building at 1414 N. E. Grand Ave. in September, it will end 36½ years in a downtown office building it moved into shortly after it was built. Westinghouse was the third tenant to move into the downtown structure after its completion in 1923 as the Wells Fargo Building and is the only one of those three still in the building, now the United States National Bank Building.

Judd Addis, office supervisor for Westinghouse in Portland, was with Westinghouse when it first moved in and is now the "oldest settler" in the office building.

The new $54,000 office building on Portland's east side was built for Westinghouse on a long-term lease.

► Westerners joined other members of D. W. Onan & Son's newly organized distributors advisory council at a meeting with Art Johnson, Western regional manager. **Phillip Seynei,** Ets-Hokin & Galvan, San Francisco, is a permanent member of the council. Rotating members from the West are: **Moore McKinley,** Fremont Electric Co., Seattle; **Wendell Cross,** B. K. Sweeney Co., Denver; **John Brynelsen,** Simson-Maxwell Ltd., Vancouver, B. C.

Seynei

► Admiral has discontinued its Denver distribution outlet and has appointed **Griffin Distributing** Co. to handle its major appliances and electronic products. Griffin is located at 1140 W. Fifth Ave., former location of the factory controlled branch office. John Conger, former branch manager for Admiral, is vice-president in charge of sales for the new organization.

► **John Nicassio** will represent Electrical Specialty Co. in the Arizona area and may be reached at Box 232, Phoenix. He was active for many years in the company's Los Angeles office.

► **General Equipment** Co., 448 Ala Moana, Honolulu, is distributing Powers-American utility bodies and equipment in the State of Hawaii.

Jet Line Gun Saves Hours!

New fast safe system for wiring conduit eliminates snaking!

DON'T

use a steel fish tape and spend many dangerous hours snaking it through a conduit.

Don't snake it . . . jet propel it! That's the Jet Line system in a nutshell.

A small, jet-propelled cartridge does the trick! Launched by the Jet Line Gun, it twists around ells and bends up and down as it lays a strong nylon line in the conduit in seconds. Using the nylon line, draw a foot-marked Jet Line polyethylene rope through and you're ready to pull wire.

Safe, sure and fast, the Jet Line system saves wire, money and time!

Thousands of contractors use the Jet Line Gun. Order your Jet Line Gun Kit TODAY!

DO

use a Jet Line Gun and safely jet-propel a nylon line through the conduit in seconds!

THE JET LINE SYSTEM IS SAFE!

- No powder charge — No explosion
- Both nylon line and polyethylene rope are non-conductors.

THE JET LINE GUN was invented by experienced electricians for use in rigid and flexible steel conduits, underfloor and underground ducts and cavity wiring structures. For runs up to 300 ft. . . . double this distance when launched into both ends of the run.

Ask your distributor or write

Pat. Pending on Method and Apparatus

Jet Line Gun Company

730 Seigle Ave., Charlotte, N. C.

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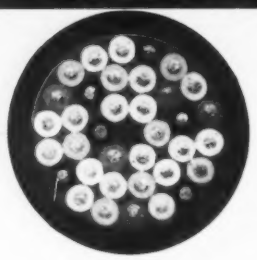
Copyright 1958 Jet Line Gun Co.

How many conductors?
Bronco 66 Certified is made with from 5 to 60 conductors—more on special order—and carried in stock in nation-wide company warehouses.

What A.W.G. size?
Bronco 66 Certified ranges from size 18 through 4.



Highest Neoprene content!
Bronco 66 is a true Type SO, oil-resistant cable, the only portable control cable to bear UL approval. Outer protecting jacket is certified by a Registered Professional Engineer to contain not less than 67.32% Neoprene—*highest content in the industry!*

*Patented Branding!**
Molded* permanently into the jacket are "Bronco 66 Certified," type, size, number of conductors, rated voltage. With data repeated every two feet exactly, cable is self-measuring.

Want real flexibility?
You get a degree of flexibility that can't be equalled because only Bronco 66 Portable Control Cable is Synchro-Cured, fine stranded, electrically annealed for maximum flex life.

Also stationary control cables and shielded control cables

*U.S. Patent No. 2867001

WRITE FOR FREE, CONDENSED CABLE CATALOG

Bronco Representatives in the West:
CALIFORNIA, Western Insulated Wire Co., (Home Office) 2425 East 30th St., Los Angeles 58; The Curry Co., 305 King St., San Francisco; **NEW MEXICO,** John Carder, Jr. Co., 1624 N. 1st St., Albuquerque; **OREGON,** George M. Roth, 1504 N. W. Johnson, Portland 9; **UTAH,** John Carder, Jr. Co., 1415 So. Main St., Salt Lake City; **WASHINGTON,** Jack H. Stumph, 1000 - 4th Ave., South, Seattle 4.

Earnings

Steady improvement in sales and earnings were reported by **General Electric** in its mid-year report. Net sales billed for the first six months of 1959 totaled $2,065,447,000, up 4% as compared with the same period of 1958. Earnings were $117,239,000, up 13%.

Kennecott Copper Corp. reported six-month earnings of $4.32 a share as compared with $2.07 last year. Average price received during the period was 30.1¢ a pound, with shipments totaling 279,600 tons.

Westinghouse reported net income up 15.5% in the second quarter of 1959 as compared with the same period last year. Net sales billed were $474,132,000 in the 1959 period; $474,632,000 in the 1958 period. Net income in the 1959 quarter was $19,741,000 against $17,070,000 in the 1958 quarter. Highest second quarter earnings previously reported by the company were $19,073,000 in 1954.

A new record on second quarter profits was reported by **Allis-Chalmers,** with a 40% increase over the same period of 1958. Earnings totaled $8,832,497 as compared with $6,198,297 in 1958. Sales for the second quarter this year were $137 million, down about $13 million from last year because of strikes in April.

► With the opening of a plant at Newark, Calif., **A. O. Smith** is producing Permaglas water heaters on the West Coast. Formerly these heaters were produced only at Kankakee, Ill. The 250,000-sq-ft Newark plant, about 18 miles south of Oakland, has been remodeled to handle the present production of 10,000 units a month on a one-shift basis and is capable of a 25,000-unit output. **Don Hartquist,** formerly plant engineer at Kankakee, is manager of the Newark works.

Hartquist

► **Electronics Supply** Co. of Pasadena has been named southern California distributor for Babcock Relays Inc. **Don Dressen** is president of the firm.

► **F. Y. Gates** Co. will represent **Measurements Division** of McGraw-Edison Co. in the Rocky Mountain area.

Don't Price Yourself Out of the PLUS Features You Get with SQUARE D CONTROL CENTERS

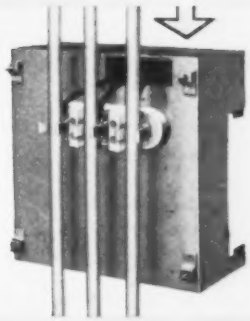
Industrial construction
All outer surfaces and structural parts are 12 gauge steel. Corner channels, cross members and doors are *formed* on special dies for maximum rigidity. Rust-resisting finish—phosphatized plus *baked* enamel.

Saves space
Unit heights in 3-*inch* increments—an exclusive Square D advantage which permits use of units with minimum heights, eliminates the wasted space typical of modular systems.

Built-in safety
Units are metal-enclosed to confine damage should a fault occur. Unit side plates are permanently attached—can't be accidentally discarded. Switch-type units have visible blade disconnects for added safety.

Extra control flexibility
A variety of removable panels accommodates up to four oil-tight push buttons and pilot lights.

Tubular vertical buses
Another Square D "exclusive"—inherently stronger—greater cooling surface. Extra-wide spacing between phases gives added "breakdown" protection. Plug-in stabs are silver-plated copper backed by steel springs—give high pressure low resistance contact at all times.



Liberal wiring space
Wiring channels are *large and accessible*. No wire fishing through narrow passageways—wires can be laid in position—less costly installation.

GET THE COMPLETE STORY

BULLETIN SM-244 gives detailed information on all of the "plus" advantages you get when you specify Square D motor control centers. Send for a copy. Square D Company, 4335 Valley Blvd., Los Angeles 32, Calif.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

For phone number of closest representative see advertising index in back of book.

READ THIS before you specify High Voltage Transmission Clamps or Hardware

BTC HI-LINE HARDWARE CATALOG

Contains valuable reference information, pictures, blueprints and complete specifications on BTC's entire line of DROP-FORGED Steel and Aluminum Hi-Line Hardware.

Send the coupon below . . . this complete BTC Hi-Line Hardware Catalog will be mailed to you without charge.

Pioneers in Drop-Forged Hi-Line Hardware

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The BREWER-TITCHENER CORPORATION
HI-LINE HARDWARE DIVISION
Cortland, New York

☐ Send complete BTC Hi-Line Hardware Catalog

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

► **Wiant Products Co.**, 1231 N. W. Hoyt St., Portland, is manufacturer's representative for Oregon and southwest Washington for EMP Electric Ltd., London, England, manufacturer of arresters and high-voltage interrupting fuses, and for South Wales Switch Gear Ltd., Blackwood, England, manufacturer of metal-clad outdoor-type switchgear.

► **Du Mont Emerson** Corp. has appointed **Public Distributing** Co. of Denver as its distributor in Colorado, New Mexico and Wyoming. **Al Jennings** Co. is covering Arizona.

► **O. B. Wilt** Co., San Carlos, Calif., is representing **Sun-Tron,** electric heating equipment manufacturer, in California, Oregon, Washington, west Nevada and Arizona.

► **Robert N. May** has been named sales manager of major appliances for the Los Angeles district, Westinghouse Appliance Sales, with headquarters at 4601 S. Boyle Ave., Vernon. He comes from Des Moines, Iowa, where he was sales promotion manager for Appliance Sales. He joined the company in 1955 in Chicago.

► **Hewlett-Packard** shareholders have approved a merger with **Dymec** Inc. of Palo Alto.

► **R. G. Masters,** formerly vice-president and general sales manager of Appliance Wholesalers, Portland, has joined Fowler Distributing Co. as sales manager. Fowler handles Gibson, Hoffman and Fowler products.

► **Bob Kehlstaedt** is new manager of the Spokane office of Taylor Distributing Co. Inc., distributor for Kitchen-Aid dishwashers.

► Vic Paul Co., Portland, reports utility and contractor interest in a new transistorized road barrier and blinker brought out under the Esco brand by Electronic Specialties Co., Attalia, Ill.

► **Truck Equipment Co.** of Denver has made Rocky Mountain Export Co. its exclusive export sales management, according to E. V. Garnett, Truco president. Truco products include cable reel carriers, diggers, derricks, tensioning and reconductoring equipment, aerial ladders and aerial lifts for utility construction and maintenance. It has recently announced new tensioning equipment, which pulls and tensions four conductors simultaneously.

MURRAY INTRODUCES...

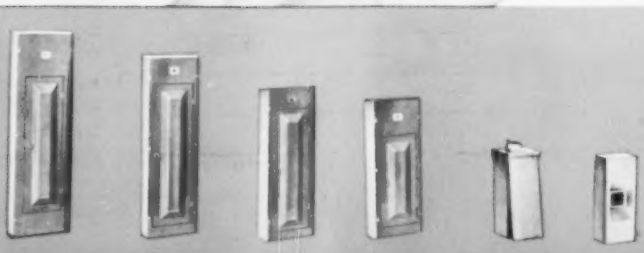
THE FIRST 200 AMP CIRCUIT BREAKER DESIGNED FOR RESIDENTIAL USE

now, for the first time, a fully magnetic 200 Amp breaker main disconnect in a full line of "MP" load centers far smaller than comparably rated main pullout equipment—

Perfect for your Gold Medallion Home Installations

See reverse side for details

Available in a full line of load centers

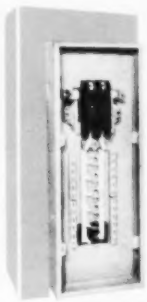


60 1890 1950 TH YEAR Murray

Amazingly Compact Breaker Main Makes Possible First Really Small, Economical 200 Amp Load Center

At least 31% SMALLER...

than 200 Amp Load Centers with fusible mains

Competitive Fusible Main Load Center A	Competitive Fusible Main Load Center B	Competitive Fusible Main Load Center C	Competitive Fusible Main Load Center D
			
31% Smaller	84% Smaller	106% Smaller	163% Smaller

MURRAY 200 AMP CIRCUIT BREAKER

Listed by Underwriter's Laboratories, Inc.

- **compact frame size**
- **low price**
- **ideal for residential use**

plus...fully magnetic operation ...no thermal element!

The new Murray 200 Amp breaker contains all the important advantages of fully magnetic operation. It carries full rated load and is entirely unaffected by heat. Check these other features:

- **Tungsten silver contacts**
- **Only two switch positions**
- **Resets immediately**
- **Also available in 125, 150, 175 Amp trip ratings**

Now, for the first time anywhere, contractors can give residential customers who need 200 Amp capacity true circuit breaker protection right from the main disconnect down through all the branches. And do it at a surprisingly reasonable cost, too.

The new Murray 200 Amp breaker is so compact for its rating, it permits load centers *far smaller than comparably rated fused* main pullout equipment. (See above)

These load centers contain all of Murray's new design features for easier, faster, more economical installations:

Neutrals on top near main breaker: conveniently located in center of distribution area, saves cable and installation time.

Connectors for copper or aluminum: lay-in type connectors with pressure plates are U.L. approved for use with either copper or aluminum conductors–

Plaster line adjustments: separate dead front shield simplifies plaster line adjustments–

Shallow box construction: depth of load centers has been reduced to $3^{1}/_{16}$", ideal for dry wall construction. This plus redesigned cover swell assures perfect flush mounting.

Other features include sequence bussing and truly generous wiring room despite small outside dimensions. If your homeowner customers have 200 Amp requirements, this new line is just what you need.

See it soon at your Murray wholesaler's–or write direct for complete details. Murray Manufacturing Corp., 1250 Atlantic Avenue, Brooklyn 16, New York.

60 1899 1959 TH YEAR Murray

LOAD CENTERS			MAIN DISCONNECT ENCLOSURES		
	Max. No. Positions		Catalog Nos.		Breakers Installed
Cat. No.	1 Pole	2 Pole	Indoor*	Raintight•	
LC220DS	20	10	LD200AS	LD200R	2 Pole 200 Amp
LC224DS	24	12	LD000AS	LD000R	None‡
LC230DS	30	14			
LC240DS	40	20			

*Indoor. For flush mounting substitute suffix "F" for "S". With doors and provision for locks.

Main Breakers in above devices are rated 120/240V AC, also available in 125, 150 and 175 ampere trip ratings.

*Indoor. For flush mounting substitute suffix "F" for "S".

• Interchangeable hubs for raintight devices should be ordered separately.

‡Enclosures only, no breakers installed order separately.

Market Development

Do It Yourself

"Choose a class date, bring a screw driver, six clothespins and yourself," was the injunction to 288 women who ordered "do it yourself" lamp kits in Hawaiian Electric Co.'s recent promotion. The women, who paid $3 a piece for the kits, got a free lamp bulb and instructions for assembling the unit from utility home economists. Harriet Fujita, who opened the classes with a talk on lighting, is shown at right with display of lamp parts. Above, a class finishes the assembly job. The program was arranged by Erma Boyen, Hawaiian Electric Co.'s home service director

Average American Can Own Splitnik

More than half the families in America can afford to own the Splitnik Medallion home at Roosevelt Field, L. I., identical to the house to be shown at the American Exposition in Moscow. This statement, based on information from the American Bankers' Assn. and home financing institutions, was made by Edwin Vennard, EEI managing director.

The home sells at Commack, L. I., for $14,490 including land. In other parts of the country it would sell for $11,000 to $13,000 without a lot, Vennard said. Government statistics show that the average American workman today purchases a $14,207 home and pays for it out of $6,092 to $6,803 average salary, with $96 monthly payments.

The "Moscow" home is known as Splitnik because it is split in half by a 10-ft corridor for display purposes. The passageway serves as a gallery from which fair visitors will view the interior of the American home.

Teach Kitchen Planning

Kitcheneering classes for 461 students in a 4-H Summer School at Oregon State College were conducted by Grace Schoeni, home lighting advisor for Portland General Electric Co., and Patti Post, the utility's home service advisor.

PGE sponsors a scholarship to the 4-H school for each county in its service area, with an additional scholarship from Portland.

The two advisors presented principles of kitchen planning with slides and other illustrative material. The experience, they said, was "strenuous but stimulating."

Friendship Lights

Friendship lanterns (electric) were introduced to the customers of the areas served by Pacific Power & Light in a two-month promotion which resulted in the sale of 1,085 lanterns in 60 days. Of these, in the Yakima area alone 344 were sold.

The promotion started May 1 and ran to July 1, covering four types of customers: (1) the present customers, (2) home builders, (3) Medallion home builders and (4) employees. In each case the lantern was sold at cost and present customers were sold the lantern installed only. Employees could purchase them either installed or not. The home builders purchased their lanterns and had them installed themselves and builders who met Medallion standards were given a lantern free of charge, not installed.

Arrangements were made with electrical contractors in each area to make a normal installation for $26. This was defined as one not to exceed 50 ft from a nonswitched, nonconcealed circuit with no installation under sidewalks or driveways. Where more unfavorable conditions prevailed and costs were exceeded, these were payable directly to the contractor.

Customers put the lantern and installation costs, either $49.95 or $56.35, depending on the model, on the company's wiring finance plan for as little as $2.29 per month. Employees could have their costs deducted from the pay roll for as little as $2 per month. Home builders were sold on a 30-day account.

The Yakima area was particularly successful because it had residential and rural salesmen available for door-to-door sales effort. In other areas mailing pieces, handout pieces and word of mouth provided the sales impetus. In only one area was a newspaper ad tried but it brought no results.

The company added $4,340 in added annual revenue with no service expense. It has withdrawn from actual sales except for the home builder for the balance of 1959. It is hoped, says J. E. Beck, lighting sales director, under whom the campaign was conducted, that now that the photocell, all-night protection has been introduced electrical contractor sales allies will continue to sell this type of product.

► A new booklet, **Facts and Myths about Fair Trade,** has been prepared by the Bureau of Education of Fair Trade, 205 E. 42nd St., New York 17, N.Y.

for the LONG PULL use
Y-ER EAS
Wire Pulling Lubricant
Only Y-ER EAS has all these features
Write for descriptive booklet
- Creamy, non-corrosive lubricant. Never greasy or messy.
- Prevents sticking or setting. Specially helpful on saddles and turns.
- Does not run back on cables.
- Never harmful to hands or clothing.
- Permanently non-harmful to cables or conduit.

GIVES THE SLIP TO-
Lead, Rubber, Braid or Synthetic Covered Cables
Representative:
Matzinger-Johnson Co.
1329 Willow St.
Los Angeles 13
Phone: Madison 4-8001
ELECTRO COMPOUND CO.
4148 W. 150th St., Cleveland 35, Ohio

PREMIUM COMFORT . . .
REASONABLY PRICED
WITH HEATSUM VENTILATED BASEBOARD*
IT HEATS
IT VENTILATES
IT CAN FILTER
THE AIR TOO
*MANUFACTURED ONLY BY:
ROBERSON INC.
7116 220TH SOUTHWEST
MOUNTLAKE TERRACE, WASH.

Subtle Sales Tool Helps Homemaker

A new selling tool—an up-to-the-minute electric cook book—will help solve some knotty sales/service problems for utilities and their allies. Authored by Marguerite Fenner, director of home economics for Pacific Gas and Electric Co., at the request of Milliken Publishing Co., the pocket book will be a real aid to the range user and at the same time will persuade her to increase her use of all electric cooking appliances.

It is an easy-to-understand manual on use and care of the electric range, oven, broiler, portable appliances. Chapter arrangement, with logical grouping of recipes and instructions, makes for easy use. There are such helpful chapters as Good Pans—Better Cooks; Caring for Your Electric Range; Portable Appliances—Your Electric Servants; Food for Fitness.

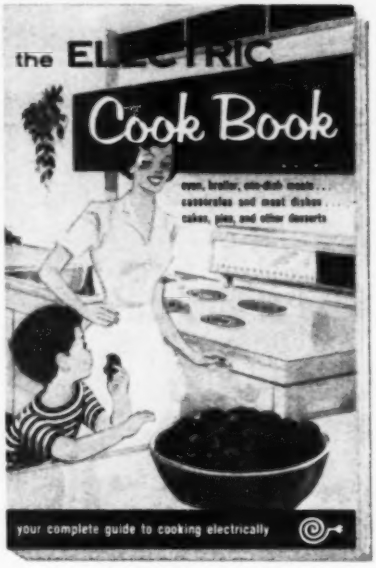
Well known for her program of mass promotion and education, Mrs. Fenner designed the book to promote electric range sales; build kwh sales through greater use; increase customer satisfaction; reduce complaints and service calls; aid in building better public relations.

It is suggested that the book might also be used as a point-of-sale traffic builder; to stimulate attendance at cooking schools and other group meetings; and a give-away for promotions; as a school text book; to induce prospects to buy or as a "thank you" gift to buyers; as a gift to new customers, brides, new mothers; as an Electric Living distribution piece.

The pocket-size book, with heavy paper cover, runs 192 pages with index. It is available from Milliken Publishing Co., Box 3451, Richmond Heights, St. Louis 17, Mo., in quantities from 13¢ to 18¢ each, depending on size of order. Imprint on back cover is optional at additional cost.

Campaigns

Leading **freezer manufacturers** participated in a $170,000 promotion sponsored by **Northern California Electrical Bureau** through August. In addition to furnishing suggested displays and advertising, the bureau encouraged dealers' participation with a window and in-store display contest. U. S. Savings Bonds and frozen food orders are the prizes for those who meet the conditions and are lucky enough to win in a series of drawings.



Public Service Co. of Colorado's D and B Round-up" reports that the area's spring laundry promotion netted 4,594 sales, totaling more than $1,000,000 retail. At the wind-up, some 350 salesmen were honored at a stag party hosted by distributors, utilities and associations.

Heat pumps took the spotlight in a recent ad, one of a series being run by **Modesto Irrigation District.** Worked up jointly by Clifford Plummer, chief engineer of the district, and Robert E. Olson of the Modesto *Bee*, the ads are run once a month in color.

► For the second consecutive year **Public Service Co. of Colorado** has won a Public Utilities Advertising Assn. top award for a dishwasher window display.

WANTED!
TWO—ELECTRICAL DISTRIBUTION ENGINEERS B.S. DEGREE preferred. Must have at least 2 years' practical experience in design of electrical distribution and transmission facilities. Generation experience desirable but not required. Excellent opportunities for the right men in a rapidly expanding operation. Salary commensurate with experience and record.
Contact—Town of Farmington Electric Utility System, Farmington, New Mexico.

Edison Signs Largest Medallion Tract

Largest single Medallion home contract in the nation was signed last month with Southern California Edison Co. The agreement for 1,350 homes was made between Harris P. Goldberg, president of the Conejo Valley Development Co., and T. A. Esling, Edison district manager.

The development, Weathersfield, will be built near Thousand Oaks. It will combine the casualness of rural living with city conveniences. Homes will be priced at about $15,000 but will incorporate many "plus" features, Goldberg said.

Asked why he decided to make Weathersfield a Medallion development, he replied: "Because my experience has proved to me that Medallion homes sell three times as fast as other homes, that's why."

Free Panels Pay

Giving away 200-amp entrance panels is paying off for Klickitat County PUD. The policy was instituted last year for customers adding major appliances, building new homes or rewiring old ones, and results were given in the utility's annual report.

The PUD gave away 200 of the panels. Result: 57 homes added electric heat, 58 added water heaters, 59 ranges, 37 dryers and 15 washers. Thirty-seven homes were rewired and of 31 new homes built 21 were all-electric.

Commented the report: "The cost to the PUD for these entrance panels will be repaid the first year out of increased consumption of electricity and will show a gross profit of $14,000 besides."

► Increasing popularity of **copper, stainless steel** and **natural wood-fronted appliances** was reported in a survey conducted by Waste King in Los Angeles. Copper panels—with 20.49% of those sold during recent months—was second to white, which took 42.10% of the orders. Stainless steel got 12.65% and natural wood shades 10.40% of the orders. Yellow panels led the color field, with 4.46%, followed by pink and turquoise.

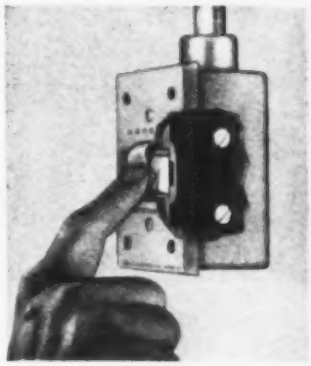
► Nine manufacturers are supporting the **Inland Empire Electrical League's electric heat promotion,** which started Aug. 17 and will run through September. At request of league contractors, last year's effective "Tailor-Made" theme will be used again.

CAT. NO. 1751

WEATHERPROOF

*INSULPRENE PLATE and A.C. presSwitch COMBINATION

Introducing a combination unit—complete in one box—including weatherproof "Insulprene" plate and A.C. "Presswitch" . . . designed for all general outdoor applications: shipping areas, parking lots, gas stations, breezeways, etc. The weatherproof "Insulprene" plate fits both FS and standard wall boxes. The combination is available with 15 or 20 amp. "Presswitch" either single pole, double pole, 3-way or 4-way. "Insulprene" plate resists oil, hot water, live steam, extreme cold, grease, etc.



Cut-away shows A.C. "Presswitch" mounted in FS box and protected by new Weatherproof "Insulprene" Plate.

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

*made of DuPont Neoprene

For complete information write

HARVEY HUBBELL, INCORPORATED
Bridgeport 2, Connecticut

WIRING DEVICE OFFICE AND WAREHOUSE LOCATIONS

Bridgeport 2, Connecticut
State and Bostwick Streets

Chicago 7, Illinois
37 South Sangamon Street

Los Angeles 12, California
103 North Santa Fe Avenue

San Francisco, California
1675 Hudson Avenue

IN CANADA:
Scarborough, Ontario,
1160 Birchmount Road

end CONDENSATION with SECULATE

SECULATE Compound used at new Caribou Hydro Plant of P.G&E. on Feather River.

SECULATE Anti-Condensation Compound Works on Every Type of Surface

SECULATE compound is readily applied with a 3" to 4" brush, and has been successfully used in a wide range of installations. It is effective on metals, pipes, concrete, brick-work, plaster, hardboard, wood, etc. SECULATE works by setting up a barrier to temperature differences which give rise to the deposition of moisture; in addition, it will absorb moisture and gradually release it as the air becomes dry.

For illustrated brochure and specifications contact

WRATHALL & KRUSI, Inc.
681 Market Street San Francisco 5, Calif.

Factory representatives—11 Western States

Distributors: Southern California, Arizona, Southern Nevada—Industrial Engineers & Equipment Company, 2975 Wilshire Blvd., Los Angeles 5, Calif.

People

► **Dr. George T. Harness** has been named dean of engineering and science at the new San Fernando Valley State College in Northridge, Calif. An active AIEE member, Harness had formerly been associate dean of engineering at the University of Southern California. At the present time he is national vice-president of AIEE. During World War II he was a consultant for the War Department and co-authored the ASTP program in electrical engineering. He has also served as an inspector for the Engineers' Council for Professional Development, examining and evaluating programs in electrical engineering in the Western states.

Harness

► **Stanley D. Reed** has been named apparatus engineer in the Pacific Northwest for Line Material Industries. He will assist with apparatus application problems facing customers in Washington, Oregon, Idaho and Alaska. Headquarters are in Portland. Formerly a field engineer at Chicago, Reed replaces **Robert L. Lemman.**

Reed

► **Bernard C. West,** assistant to the Western regional manager and district sales manager for Federal Pacific Electric Co. at San Francisco, has been named general sales manager for Mears Electric Circuit Breakers Inc. of Portland. West, a graduate of Northwestern University in electrical engineering, was a field engineer for Federal Pacific at Seattle before going to San Francisco in 1955. Earlier he was sales manager for Pacific Oerlikon Co. at Tacoma and an application engineer for Westinghouse Electric Corp. in Seattle.

West

ALLIS-CHALMERS ANNOUNCES

POWER FACTOR CAPACITORS

25 and 50 kvar, 2400 thru 7960-volt capacitors

. . . available for immediate shipment

- meet all the national standards
- a *complete* capacitor package (capacitors, racks, voltage and current controls, other accessories)
- Five years of research, design and development bring you the best in capacitor engineering!

Where to get more capacitor facts fast!

Call, write or wire . . .

ALLIS-CHALMERS

A 1160-E

For phone number of closest representative see advertising index in back of book.

From regulator to lamp

. . . use cost-saving

SUPERIOR CABLES

Thermoplastic Series Lighting Cables

- High resistance to earth acids and alkalis
- High resistance to sunlight, moisture, weather
- Small diameter, lightweight
- Easy to splice

Figure 8 Pole & Bracket Cable

- High resistance to abrasion, mechanical damage
- Does not deteriorate with age or weather
- Will not support combustion
- Flexible, strips clean, speeds installation

Performance and economy go hand in hand with SUPERIOR plastic insulated and jacketed cables.

All SUPERIOR CABLES are quality-engineered, precision manufactured and thoroughly tested.

From regulator to lamp . . . for low initial cost . . . for less maintenance cost . . . order SUPERIOR CABLES!

For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

3869

► **Burton H. Piper** has been appointed North Pacific district manager of engineering and service for Westinghouse Electric Corp.'s Apparatus Division. He will make his headquarters at 3451 E. Marginal Way, Seattle. Prior to the Seattle appointment he was electrical supervisor in the South Pacific district at Los Angeles. He succeeds the late **R. L. Von Lossow.**

Piper

► **Frederick W. Braun,** a chemical engineer, has joined the research department of Pacific Power & Light Co. and will be in charge of research projects related to industrial utilization of chemical industry raw materials in areas served by the utilities. He will work also with chemical and petroleum companies interested in locating in PP&L service districts.

Braun

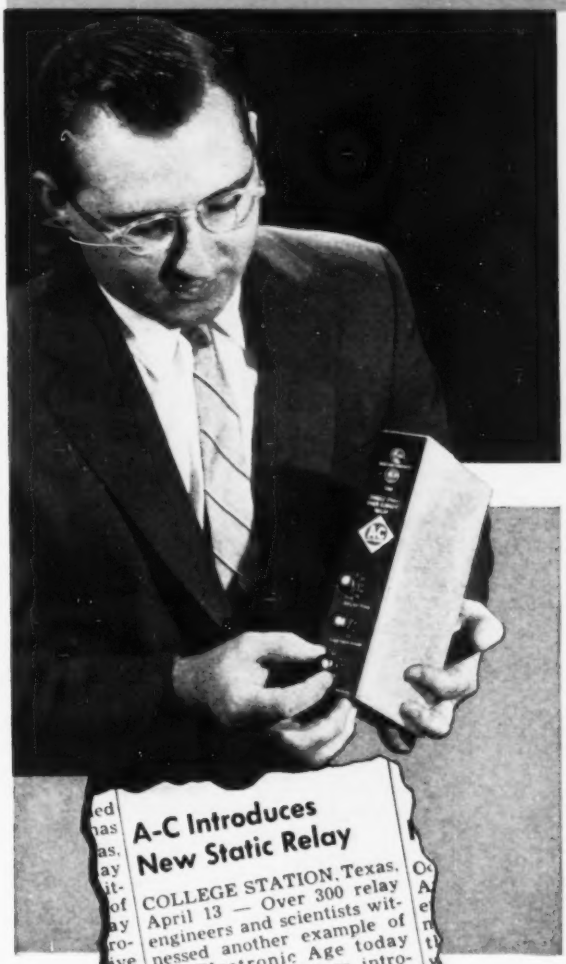
► **R. L. Patrick** has been named district sales representative for the Moe Light Division of Thomas Industries Inc. He is a certified lighting specialist and will work with electrical distributors in eastern Washington, northern Idaho and throughout Montana. He has been with the Crane Co. in sales promotion and heating sales engineering in Spokane.

Patrick

► **W. Edward Hurford** has been appointed Arizona manager of Westinghouse Electric Supply Co. He will headquarter at 1110 N. 21st Ave., Phoenix. He replaces **William B. Harper,** who has been appointed national sales manager of inside apparatus and supplies for WESCO.

► **Leo K. Yinger** has been appointed electric operations supervisor for the Arizona Public Service Co.'s metropolitan division, which includes Phoenix. He has been load voltage control supervisor since 1957.

ALLIS-CHALMERS modern line for '59



Small size saves panel space.

FIRST

completely static protective relay!

. . . available in Allis-Chalmers switchgear

This highly reliable *new* protective overcurrent relay has no moving parts . . . it's static, and it's only ⅓ the size of conventional relays.

Employing transistors, printed circuits, and other electronic components encased in epoxy-resin, A-C static relays are shock and moisture resistant They're unaffected by temperature changes, operate with low burden, and have instantaneous reset feature. Quick plug-in construction makes replacement easy.

Want more protective relay-equipped switchgear facts? Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C Introduces New Static Relay

COLLEGE STATION, Texas, April 13 — Over 300 relay engineers and scientists witnessed another example of the Electronic Age today when Allis-Chalmers introduced a new static protective relay. The new development was disclosed in an engineering paper presented by John Baude, Allis-Chalmers engineer, before the Twelfth Annual Conference for Protective Relay Engineers.

The new relay, designed for industrial switchgear application, is the first major departure from conventional relay construction in 50 years.

NO MOVING PARTS

Of particular significance is the elimination of all moving parts through the use of semi-conductors such as transistors, diodes, thermistors, and varistors. Use of these components combined

A-1157-E

ALLIS-CHALMERS

For phone number of closest representative see advertising index in back of book.

These four veteran Idaho Power Co. employees have been named to important new posts by the utility's board of directors. From left, they are R. F. Ball, H. R. Moore and J. F. Emery, all elected vice-presidents, and M. M. Ilch, named treasurer

Association Affairs

B. C. Inspectors consider a contest. At head table John Dooley, secretary; James Walker, vice-chairman; D. C. Cornborough, chairman; Lance Robson, provincial chief inspector. Jack Harrison, Vancouver inspector, speaking on steering committee recommendation

NAED

With a theme "Keys to Future Selling, Operating and Managing," exemplified in a dramatic presentation to open the first general program, the 51st annual Western Region convention of National Association of Electrical Distributors at Hotel Miramar convention hall, Santa Barbara, Sept. 20-23, promises a record attendance, according to Ralph W. Rohrbach, Western Region vice-president, and W. M. Jewell, secretary-manager.

An exceptionally attractive program has been arranged by K. P. Rehwaldt of General Electric Supply, Los Angeles. There will be three general meetings for members and guests, one each morning, climaxed by a noon luncheon for members, guests and their ladies on Wednesday, Sept. 23, and a banquet and dance at night.

The Monday program, chairmanned by E. C. Phillips, Coast Electric Co., San Diego, will feature by popular demand a re-enactment of the clever skit by Ken Rehwaldt and Jack Ross "We Won't Be Selling Like This." It will be followed by a new sound slide film by Dartnell Corp., "Solid Gold Hours," dealing with preparation for selling. R. S. Edwards of the Edwards Co., Norwalk, Conn., will speak on "Where Will We Be Selling?" Gar Morse, vice-president, Sylvania Electric Products, will follow with "What Will We Be Selling?"

Monday night, with a Hawaiian theme, the manufacturers will present a cocktail party at the Biltmore Hotel Coral Casino Club.

After three area breakfasts for members only on Tuesday morning, the general meeting, as the first morning's session dealt with selling, will deal with operating. Maage LaCounte, Columbia Electric, Spokane, will be chairman. NAED's national president, George Provost Jr., will be the featured speaker, giving a talk on "The Future of NAED." Following the "operations" theme, the subject of "People" will be dealt with by Bert Wiegenstein, Westinghouse Electric Supply, Seattle; "Places" by Kinsey Robinson, Washington Water Power president; and "Things," a presentation on the use of computers by distributors, given by Roy Jordan of the General Electric Computer Division, Phoenix.

Wednesday's session will be under Vern Cooper, GESCO, San Francisco, as chairman and will lead off with a talk on "Management, Our Greatest Challenge" by Arthur Hooper, executive director of NAED. "New Horizons for the Electrical Industry" will be unfolded by O. R. Doerr, vice-president, PG and E, and R. C. Harper, vice-president, Sylvania, will talk on "Objectives and Policies – Management's Tools for Progress."

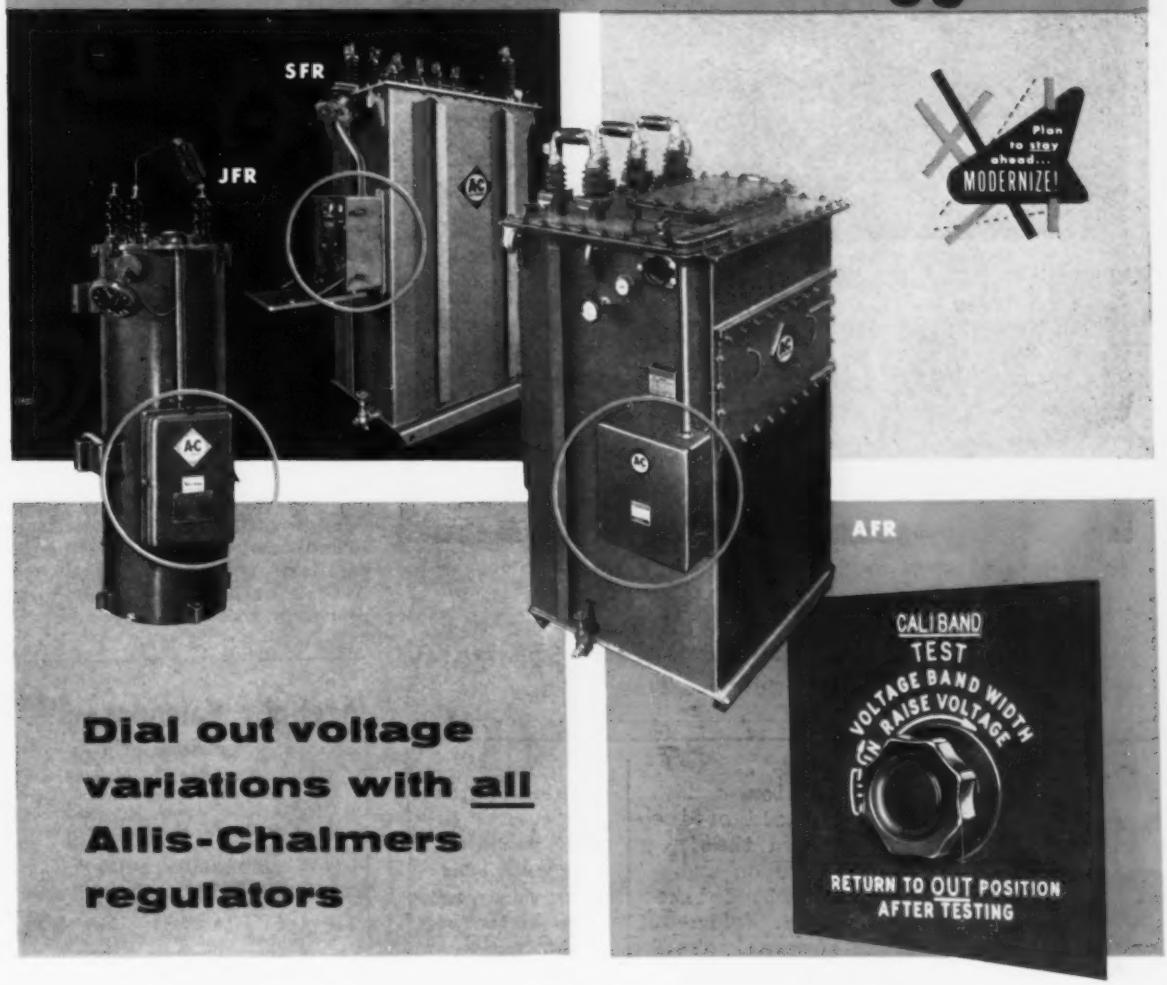
"Building Character—A Management Responsibility" will be presented by R. H. Jones, general manager of the General Electric Supply Co., Bridgeport.

At the luncheon presided over by John Lawton, Graybar manager, Seattle, Dr. William H. Alexander, a brilliant speaker, has been asked again to address the group. His topic "The Power to Become" is promised as an inspirational message to conclude the business session. General chairman of arrangements is S. W. Mesick, Westinghouse Electric Supply, Los Angeles. R. M. Cooley is chairman of entertainment; E. E. Karsten of golf; Irving Bean of resolutions; and Kenneth Hartley of budget.

Inspectors

Electrical Inspectors' Assn. of British Columbia at its last quarterly

ALLIS-CHALMERS modern line for '59



Dial out voltage variations with all Allis-Chalmers regulators

New Caliband regulator control gives you precise settings with a twist of the knob...ends customer complaints

Caliband is an Allis-Chalmers trademark.

Caliband control gives you complete freedom to test and accurately set voltage level and band width. There's no interruption of regulated service, no changing of customer voltage. Just a simple twist of the knob does the job.

CALIBAND control demonstrated

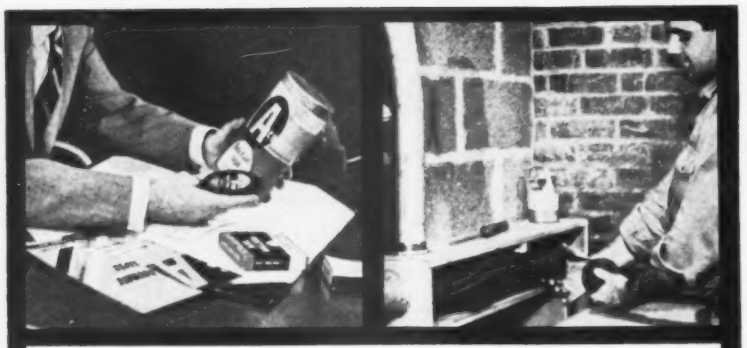
A call to your nearby A-C office will bring an engineer and a *Caliband* control demonstration kit to your desk. Or, write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Originators of 5/8% Step Regulators

A 1156-E

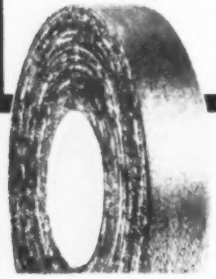
For phone number of closest representative see advertising index in back of book.



They both know the best buy in tape . . .

ACCURATE TAPES
FRICTION . . . . RUBBER . . . . PLASTIC

non-raveling
straight tearing
high tensile strength
strong adhesion
highly insulating

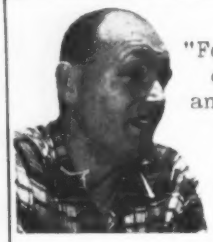


Send today for our most recent bulletin describing details.

ACCURATE MANUFACTURING COMPANY
Garfield, New Jersey

meeting in June decided to conduct an essay contest among its members based on a study of the Canadian National Code. Jack Harrison, Vancouver city inspector, reported for the steering committee to D. C. Cornborough, association chairman, at the Burnaby meeting. After hearing from code committee chairman John Lowe, discussion centered on clarification of several sections of the Canadian code. Provincial chief inspector Lance Robson deplored the unsafe and unsightly temporary construction service poles. The group voted to join with the Puget Sound Chapter, IAEI, at its next meeting in Bellingham, Wash.

Southern California Chapter, IAEI, questioned the use of aluminum conduit for service entrance masts at its Santa Barbara July 22 meeting. The group heard reports of tests made in Shreveport, La., and presented at the North Louisiana-East Texas Chapter, IAEI. Also read was a letter from Dixon Lewis, Aluminum Co. of America, relative to tests made by that company. All of these recommended against its use as a service mast if unsupported above the roof line.



"For a combination electrical field office and storage shed that's quick to move on and off the job, I like Porta House. We have them on several jobs."

Just telephone Porta House collect and get immediate delivery. Prefabricated, bolted, waterproof plywood panels—can be moved on a pick-up truck.

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Meetings Calendar—1959

SEPTEMBER

7-11—*Illuminating Engineering Society*, National Technical Conference, Mark Hopkins and Fairmont Hotels, San Francisco.

16-18—*AIEE - ASME*, Engineering Management Conference, Los Angeles.

16-18—*NWPPA*, Power Use Workshop, Ephrata, Wash.

20-24—*National Association of Electrical Distributors*, Western zone convention, Hotel El Miramar, Santa Barbara.

25—*Intermountain Electrical Assn.*, Fall Dealer Conference, Newhouse Hotel, Salt Lake City.

28-30—*NEIPA*, annual convention, Hotel Vancouver, Vancouver, B.C.

30-Oct. 1—*NWPPA*, Accounting & Finance Workshop, Clark County PUD, Vancouver, Wash.

OCTOBER

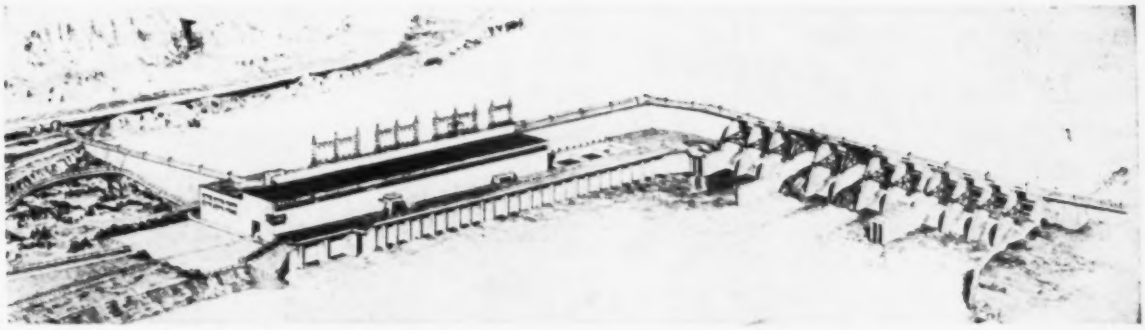
25-29—*RMEL*, annual convention, Broadmoor Hotel, Colorado Springs.

NOVEMBER

5-6—*PCEA Hawaiian conference*, Princess Kaiulani Hotel, Honolulu.

16-17—*PCEA*, Administrative Series, Rickey's, Palo Alto, Calif.

27-Dec. 2—*San Diego Bureau of Home Appliances*, annual Electrical and Home Appliance Show, Electric Building, Balboa Park, San Diego.

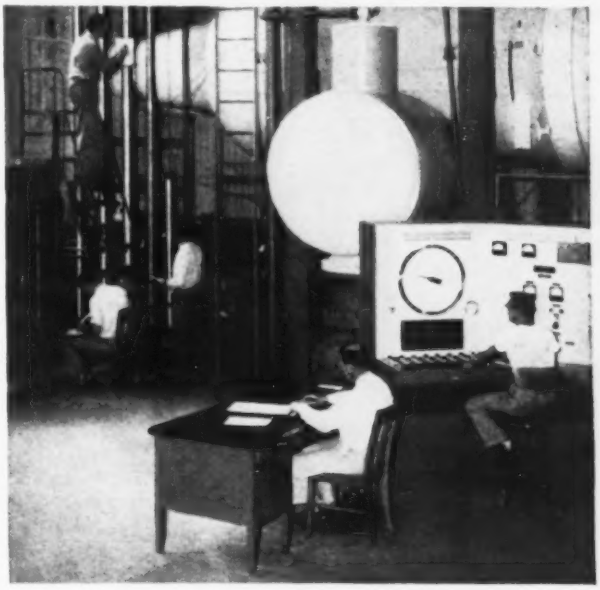


Rocky Reach Hydroelectric Project, under construction on the Columbia River by Public Utility District No. 1 of Chelan County, Washington. Stone & Webster Engineering Corp. are Engineers and Supervisors of Construction. The installation is downstream from Chief Joseph Power Project, where six 100,000 HP vertical Allis-Chalmers Francis units are installed.

Homologous models for Rocky Reach were tested in the York Works Hydraulic Laboratory under controlled conditions that duplicate those in protoype field installations.

ROCKY REACH TO USE ALLIS-CHALMERS KAPLAN TURBINES

High-capacity units to be equipped with special new Runaway Speed Limiter



Rocky Reach Hydroelectric Project, scheduled to generate electricity in 1961, will be powered by seven Allis-Chalmers Kaplan turbines. These 280-inch units are each rated at 140,000 HP under a 92-foot head, with maximum expected capacity exceeding 160,000 HP under a 98-foot head. This new high-capacity design, with greatly improved cavitation characteristics, was developed by Allis-Chalmers engineers at the York Works and tested in the high head test stand there.

Each unit will be equipped with a special new turbine Runaway Speed Limiter, which will make it impossible for a speed of more than 85% over normal to be attained. The possibility of excessive overspeeds of 150-200%, previously an accepted characteristic of Kaplan-type turbines, is positively eliminated. A substantial saving in the cost of generators resulted from this new method of speed limitation.

Its feasibility was proved by laboratory and field research. Field acceptance tests on installations equipped with the Runaway Speed Limiter have confirmed its complete dependability and effectiveness.

You can look to A-C for the latest design, engineering and manufacturing advances in hydraulic turbines and accessories. For information, write to Allis-Chalmers, Hydraulic Division, York, Penna.

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1100

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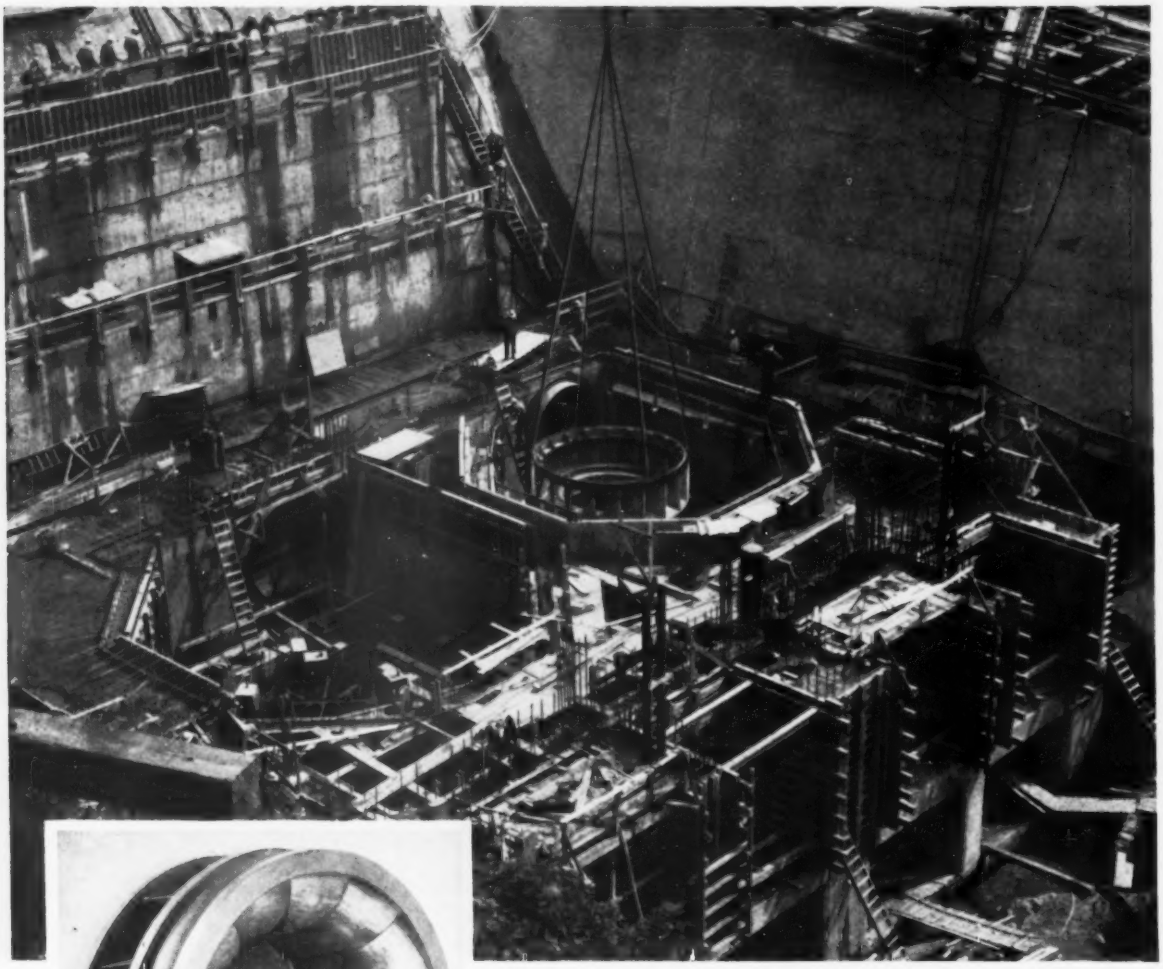
Helping to "power" the growth of the great Northwest... B-L-H Francis-type turbines for Upper Baker River



Stay ring for B-L-H Francis-type turbine being lowered into place at Puget Sound Power & Light Company's Upper Baker River Project.

Model of one of two B-L-H turbine runners for Puget Sound Power & Light Company's Upper Baker River plant. This model was tested in Eddystone's hydraulic laboratory to assure proper design prior to manufacturing actual runner.

Located near Concrete, Wash., Puget Sound Power & Light Company's Upper Baker River Project, designed and constructed by Stone & Webster Engineering Corporation, will be the 29th hydroelectric plant in the fast-growing Pacific Northwest to use B-L-H hydraulic turbines. Two vertical Francis-type turbines designed to produce not less than 60,000 hp at 200 rpm under a net effective head of 275 ft. are now being installed, and the units are expected to go into service later this year.

In addition to all four basic types of hydraulic turbines—impulse, Kaplan, Francis and propeller—Baldwin-Lima-Hamilton also manufactures governors, surge suppressors, valves, special pumps, and other accessory equipment. For more information and a free copy of our new illustrated Turbine Bulletin 1002, write to Eddystone Division (B-L-H), Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif.

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BALDWIN BLH LIMA-HAMILTON

INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

September 1959

Accurate Mfg. Co. 132
San Francisco: The Curry Co. YUkon 2-0788
Los Angeles: F. J. Airey Co. MAdison 3-2706
Seattle: Electric Agencies MAin 3-2360
Denver: L. B. Putnam Co. TAbor 5-5066
Salt Lake City L. B. Putnam Co. ELgin 5-5558

Advance Transformer Co. 29
Los Angeles: Ray J. Noel Co. AXminster 2-0191
San Francisco: Ray J. Noel Co. HEmlock 1-2176
Portland: Pete Bach Electric CApitol 7-2173
Denver: A. J. Nelson KEystone 4-6751
Mercer Island, Wn. ADams 2-8795
Albuquerque CHapel 2-8626

Allen-Bradley Co. 45, 46
Los Angeles ANgelus 9-9421
San Francisco: Campbell & George MIssion 8-1236
Denver: Young Electric AComa 2-4841
Albuquerque: A & A Supply ALpine 6-0307
Salt Lake City: Stevens Sales INgersoll 7-5489
Phoenix: Edw. P. Weller AMherst 6-3188
Seattle: J. A. Tudor Associates MUtual 2-7444
Portland: J. A. Tudor Associates BElmont 2-1188

Allis-Chalmers Mfg. Co. 127, 129, 131
San Francisco DOuglas 2-8384
Los Angeles MAdison 6-2231
Phoenix CRestwood 4-5426
Denver CHerry 4-6556
Salt Lake City EMpire 3-1723
Portland CApitol 2-9835
Seattle MAin 4-3737

Allis-Chalmers Hydraulic Div. 133
San Francisco GArfield 1-5582

Aluminum Co. of America 58
San Francisco YUkon 6-6484
Los Angeles HUntley 2-2684
Denver DUdley 8-1619
Spokane RIverside 7-6124
Seattle MAin 4-4040
Portland CApitol 2-9861
Boise 2-8038

Anaconda Wire & Cable Co. 96, 97
San Francisco YUkon 6-0051
Los Angeles MAdison 6-2371
Denver AComa 2-0616
Salt Lake City DAvis 8-0616
Seattle MAin 3-4686

Arvin Industries, Inc. 17, 18
San Francisco: D. E. Sanford Co. MArkel 1-0303
Los Angeles: Floyd Yudelson DUnkirk 7-6121
Portland ALpine 3-3226

Baldwin-Lima-Hamilton 134
San Francisco MIssion 7-6781
Los Angeles MAdison 6-5631
Portland BElmont 2-4174
Seattle MAdison 4-5420
Denver ATlas 8-2684
Salt Lake City HUnter 5-0293

Benjamin Elec. Mfg. Co. 60, 61
(subsidiary of Thomas Ind. Inc.)
Burlingame, Calif. OXford 7-1036
Los Angeles OVerbrook 5-8050
Portland CHerry 4-7214
Seattle MAin 2-0350
Spokane FAirfax 7-3278
Salt Lake City ELgin 5-2322
Denver: James Blinn Co. KEystone 4-8131

Blackburn Corp., Jasper 7
Los Angeles: Robert M. Schow HUbbard 3-7931
Oakland: John H. Ormond Co. TWinoaks 3-3235
Vancouver, Wash.: Bill Horning Sales OXford 4-4475
San Francisco: Kortick Mfg. (Ground Rods) VAlencia 6-6107

Brewer-Titchener Corp. 120

Brown Co. 54
San Francisco YUkon 2-1986
Sold through Westinghouse Electric Supply offices below:
Los Angeles MAdison 9-4161
Phoenix ALpine 8-8211
Seattle MAin 3-7001
Portland CApitol 2-9851
Spokane FAirfax 8-3371
Salt Lake City DAvis 2-2441
San Diego: Elec. Supplies Dist. Co. BElmont 2-8161
Denver: Mine & Smelter Supply Co. KEystone 4-3111

BullDog Electric Products Div., I-T-E Circuit Breaker Co. 21, 23
Oakland: Safety Switchboard Co. LOckhaven 9-7001
Los Angeles: BullDog Elec. Products of L. A. ANgelus 9-8101
Portland: Coast Elec. & Mfg. Co. ATlantic 8-5373
Denver: Young Elec. & Mfg. Co. AComa 2-4841

Burndy Corp. 110
Shaffer & Nelson, Inc. following cities:
Portland BElmont 4-7437
Seattle MUtual 2-0186
Spokane FAirfax 7-9528
San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: Earl S. Condon Co. DUnkirk 1-3951
Denver: Peterson Co. DExter 3-5434

Cereske, Wm. S. 116
Oakland TEmplebar 2-3546

Certified Ballast Manufacturers 43

Chance Co., A. B. 95
San Francisco MIssion 7-1300
Seattle MUtual 2-8920
Portland CApitol 8-3866
Los Angeles LUdlow 2-1090

Circle Wire & Cable Co. 37
San Francisco: Brill Electric Sales SUtter 1-7547
Los Angeles: Elkins Electric Agency ANgelus 8-3385
Seattle: Electric Agencies MAin 3-2360

Classified 124

Copperweld Steel Co. 109
Los Altos, Calif. YOrkshire 7-4556
Bellevue, Wash. GLencourt 4-1233

Cornish Wire Co. 132
Los Angeles CApitol 5-4226
San Francisco: G. M. Howard & Assoc. MArket 1-6759
Seattle: Sanderlin Co. ATwater 4-7777

Crouse-Hinds Co. 136
San Francisco GArfield 1-5267
Los Angeles RIchmond 9-3189
Seattle ATwater 3-7262
Portland CApitol 7-2115
Denver TAbor 5-6639
Salt Lake City EMpire 3-5513

Curtis-AllBrite Lighting, Inc. Curtis Lighting Division 26, 27
All-Brite Lighting Div. in following cities:
South San Francisco PLaza 5-7077
Monterey Park, Calif. ANgeles 8-1144
Seattle EAst 5-9600
Denver SKyline 6-1668

Dupont de Nemours & Co., E. I., Elastomer Chem. Dept. 44
Los Angeles LUdlow 2-6464
San Francisco DAvenport 6-7550
Seattle MElrose 2-6977
Portland CApitol 7-1281
Denver AComa 2-2347
Salt Lake City EMpire 4-3582

Electro Compound Co. 124
Los Angeles: Matzinger-Johnson Co. MAdison 4-8001
Portland: Oregon Mfg. Agents Capitol 6-3971
Denver: R & M Sales Spruce 7-2515
San Francisco: Electrical Sales Co. EXbrook 7-2087

Federal Pacific Electric Co. 38, 39
San Francisco ATwater 2-0810
Los Angeles CLinton 7-8281
Seattle ATwater 3-7801
Oswego, Ore. NEptune 6-4573
Salt Lake City: James Stephens Co. ELgin 5-3540
Denver: R. D. Florence Co. AComa 2-1573
Hamilton Associates CHerry 4-1505
Albuquerque: F. W. Gorman CHapel 7-1596
Phoenix: Elec'l. Eng. & Sales Corp. ALpine 3-0927

Fisher-Pierce Co. Inc. 20
San Francisco: Maydwell & Hartzell ATwater 8-6900
Los Angeles: Maydwell & Hartzell MAdison 8-7245
San Diego: Maydwell & Hartzell JU 2-6749
Phoenix: Maydwell & Hartzell ALpine 2-5858
Seattle: Oscar Hogenson MAin 2-0737
Portland: J. A. Tudor Asso. BElmont 2-1188
Denver: Allen I. Williams MAine 3-0343

G & W Electric Specialty Co. 42
San Francisco: C. E. Ingalls Sons GArfield 1-2916
Los Angeles: R. E. Cunningham & Son MAdison 8-1105
Seattle: W. R. Hendrey Co. MAdison 3-3968
Salt Lake City: Riter Engineering Co. EMpire 3-7933
Denver: H. C. Guire Co. SPruce 7-2864
Albuquerque: Frank W. Gorman CHapel 7-1596

General Electric Co. Cleveland, Lamp Div. 55
Oakland LOckhaven 9-3222
Los Angeles DUnkirk 5-1681
Denver AMhurst 6-0285
Seattle MAin 2-8081
Portland CApitol 3-2101

General Electric Co. Schenectady, Apparatus Div. 12, 13, 35, 36, 56, 57, 99, 100, 101, 102, 103, 104
San Francisco DOuglas 2-3740
Los Angeles MAdison 5-7381
Phoenix ALpine 8-7724
Denver KEystone 4-7171
Boise 4-3021
Salt Lake City EMpire 4-1891
Portland ATwater 8-0281
Seattle MAin 4-8300

Greenlee Tool Co. 22
San Francisco: Lippincott Co. Inc. EXbrook 2-2687
Los Angeles: Lippincott Co. Inc. MAdison 8-8186
Seattle MAin 3-3085
Salt Lake City CRestwood 7-1298

Hill Transformer Co. 4th Cover
San Carlos LYtel 3-2161
Los Angeles: Maddox Sales Co. MAdison 4-2306
Seattle: Wm. O. Proby & Assoc. MAin 3-3483
Portland: Wm. O. Proby & Assoc. CApitol 8-7261
San Francisco: Campbell & George MIssion 8-1236
Denver: H. C. Guire SPruce 7-2864
Salt Lake City: Stevens Sales INgersoll 7-5489
Phoenix: Maddox Sales Co. ALpine 2-2371
Albuquerque: Ralph D. Black Co. ALpine 5-9265

Holophane Co. Inc. 47
San Francisco YUkon 2-9655
Bremerton, Wash. TRiangle 6-4069
Montebello, Calif. RAymond 3-5738
Littleton, Colo. PYramid 4-4527

Hotpoint Co., Div. G. E. Co. 53
San Mateo-San Francisco DIamond 2-5591
Los Angeles MAdison 4-9201
Seattle MAin 3-8340
Portland CApitol 6-3776
Denver KEystone 4-0131

Hubbell, Inc., Harvey 125
San Francisco MIssion 7-3240
Los Angeles MAdison 8-7226
Denver: Paul A. Douden KEystone 4-6798
Spokane: Elmer Johnson MAin 2518
Seattle: Frank A. Strohecker MAin 3-0357
Portland: David King CApitol 8-1990

Indiana Steel & Wire Co. Inc. 8
Graybar in following cities:
San Francisco MArket 1-5131
Los Angeles ANgelus 3-7282
Portland CApitol 7-6641
Seattle MUtual 2-0123
Denver TAbor 5-7111
Salt Lake City ELgin 9-8771

Jet Line Gun Co. 117

Johns-Manville Corp. 98
San Francisco DOuglas 2-4353
Los Angeles LUdlow 7-2141
Seattle MElrose 3-4300
Denver KEystone 4-6378
Salt Lake City EMpire 4-8446
Portland CApitol 3-8260

Kaiser Aluminum & Chemical Corp. 30, 31
Oakland CRestview 1-2211
Los Angeles MAdison 6-4801
Denver ALpine 5-3459
Phoenix ALpine 3-4841
Portland CApitol 6-4351
Seattle MAin 3-7821
Spokane TEmple 8-2704

(Continued on page 137)

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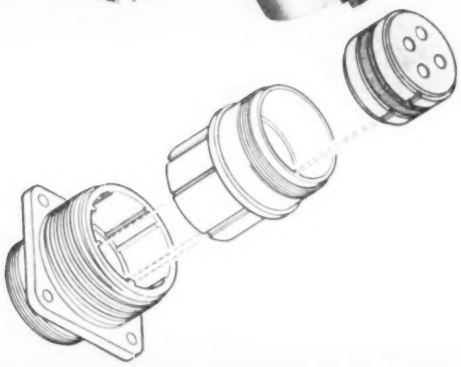

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For phone number of closest representative see advertising index in back of book.

INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

September 1959

(Continued from page 135)

Kearney Corp., James R. 112, 113
Maydwell & Hartzell, Inc., in following cities:
San Francisco ATwater 8-6900
Los Angeles MAdison 8-7245
Seattle MAin 4-2368
Portland CApitol 8-4173
Spokane MAdison 4-3285
Phoenix ALpine 2-5858
San Diego JU 2-6749
Salt Lake City: Conely Engineering Co. EMpire 3-5013
Golden, Colo.: Ralph Smith CRestview 9-5279

Klein & Sons, Mathias 10
Glendale, Calif. CItrus 3-3523
Sunnyvale, Calif. CHestnut 5-2310

Lapp Insulator Co. Inc. 59
San Francisco: Donald E. Ingalls JUneau 6-0332
Los Angeles: Earl S. Condon & Co. DUnkirk 1-3951
Seattle: Charles F. James MAdison 3-1531
Salt Lake City: Riter Engineering Co. EMpire 3-7933
Butte: R. E. McDonough Co. 2-5447

Lighting Dynamics 138
San Diego KImberly 5-4993
Los Angeles RAymond 3-9101
San Francisco JUniper 6-5266
Portland: Clyde Dodd CApitol 7-6557
Seattle: Don Gleason LAkeview 5-5151
Phoenix: Ray Wendling ALpine 2-2541

McCabe Powers Auto Body Co. 3
Berkeley LAndscape 4-4416
Portland BElmont 6-1178
Pomona NAtional 4-6464
Phoenix BRidge 5-5774
Salt Lake City DAvis 2-5658
Spokane FAirfax 5-2591
Los Angeles RIchmond 9-3424

McCormick & Baxter Creosoting Co. 25
San Francisco YUkon 2-4033
Los Angeles CHapman 5-4667
Portland AVenue 6-3654

Minnesota Mining & Mfg. Co. 28
San Francisco PLaza 6-0800
Los Angeles RAymond 3-6641
Seattle MUtual 2-5550

Moe Light (See Thomas Ind., Lighting Div.)

Moloney Electric Co. 48, 49
Garland Affolter in following cities:
San Francisco EXbrook 7-1800
Los Angeles MAdison 4-1864
Portland CApitol 3-7349
Seattle MUtual 2-4950
Denver: Hamilton Associates CHerry 4-1505
Salt Lake: Riter Engineering EMpire 3-7933

Murray Mfg. Corp. 121, 122
Los Angeles HOllywood 9-9381
San Francisco:
Ernest F. Hauch Co. HEmlock 1-1828
Portland: Northwest Sales Co. CApitol 3-5959
Denver: Gaer Sales Co. Alpine 5-7310
Phoenix: Ralph L. Mooney Alpine 3-0211

Narda Ultrasonics Corp. 3rd Cover
Los Angeles DUnkirk 8-2201
Palo Alto, Calif.: Pacific Radionics DAvenport 6-6276

Okonite Co. 11
Los Angeles MAdison 4-9677
San Francisco VAlencia 4-7474
Portland CApitol 8-3173
Seattle MAin 4-5277
Salt Lake City HUnter 4-7642

Orangeburg Mfg. Co. Inc. 62
San Francisco YUkon 6-0462
Santa Ana LIncoln 4-1195
Seattle MUtual 2-4566
Newark, Calif. SYcamore 3-2200

Pacific Gas and Electric Co. 41
San Francisco SUtter 1-4211

Pennsylvania Transformer Div. 32, 33
San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: John G. Corrin MAdison 2-0830
Seattle: Fred W. Carlson ATwater 4-4630
Phoenix: Roy E. Coulson WIndsor 3-8935
Denver: Peterson Co. DExter 3-5434
Salt Lake City: Clarence W. Silver ELgin 5-5378
Portland:
Fred W. Carlson & Associates CApitol 8-3798

Porta House 132
Oakland OLympic 2-7237
Sacramento: Robert Crownin GIlbert 3-8543
Portland: Bardi Gen. Contractors PRospect 5-4354
Los Angeles: Construction Supply Co. LUdlow 3-4158
Los Angeles: Ball & Black ANgelus 9-7586
San Bernardino: Kingsley, H. P. TUrner 9-8551
Santa Ana: Blystone Equip. Co. KImberly 2-3918

R T & E Corp. 2nd Cover
Portland MErcury 9-2161
Medford: H. L. Mooney SPring 2-9948
San Jose: N. R. Beebe ANdrews 4-5641
Pasadena: D. B. Cole SYlvan 0-5977
Salt Lake City: T. R. Van Wagoner Co. INgersol 6-2461
Bellevue, Wn.: K. H. DuBois SHerwood 6-4114
Butte: R. A. Manning Butte 2-9200

Republic Steel Corp. 105
San Francisco GArfield 1-0977
Los Angeles MAdison 4-5144
Portland: Shaffer & Nelson Inc. BElmont 4-7437
Seattle: Shaffer & Nelson Inc. MUtual 2-0186
Spokane: Shaffer & Nelson Inc. FAirfax 7-9528
Denver: C. D. Belt Co. SKyline 6-9421

Roberson, Inc. 124
Seattle LAkeside 3-1189
Seattle: Palmer Electric Co. MA 2-2170
Spokane: Wm. C. Knapp FAirfax 7-3621
Spokane: Inland Electric Co. FAirfax 7-1521
Tacoma: Bean Electric Co. MArket 7-3144
Los Angeles: O. B. Wilt Co. NOrmandy 1-4100
San Carlos, Calif.: O. B. Wilt Co. LYtel 1-2618
Graybar Electric Co. Inc., all principal cities

Royal Electric Co. Inc. 94
Los Angeles: Eckert-Lloyd Co. RIchmond 7-9655
San Francisco: Eckert-Lloyd Co. HEmlock 1-5792
Seattle: Northwestern Agencies MAin 3-8882
Portland: Northwestern Agencies CApitol 7-0434
Phoenix: Wm. Benndorf CRestwood 7-1662
Denver: Hyde Electronics Co. WEst 6-3456

S & C Electric Co. 14
Burlingame, Calif. OXford 7-1130
El monte, Calif.: Randolph Eng. Corp. CUmberland 3-4183 and 3-7901
GIlbert 3-1701
Phoenix: Randolph Eng. Corp. ALpine 8-5281
Salt Lake City:
Riter Engineering INgersoll 7-9449
Seattle: Muth-Richards Co. EAst 3-2128
Portland: Andrew L. Polich, Inc. CApitol 3-6241

Sangamo Electric Co. 24
San Francisco: L. A. Nott HEmlock 1-4738
Los Angeles: (Factory Sales) DUnkirk 7-2336
(Time Switches) ANgelus 8-6771
Seattle: T. R. Wood MAin 3-8204
Denver: Mt. States Machinery CHerry 4-7421
Phoenix: J. E. Redmond Co. ALpine 4-8471
Portland: R. L. Schoenberger CApitol 3-8742
Butte: R. E. McDonough Butte 2-5447

Slater Mfg. Co. 115
San Francisco: Baxter Co. MArket 1-8636
Los Angeles: Jack Payne Co. MAdison 4-7317
Denver: Don Steinkamp EAst 2-7961
Bruce Emmett in following cities:
Portland BElmont 2-8117
Seattle MUtual 2-6737
Spokane FAirfax 7-5670
Salt Lake City DAvis 2-3828

Smoot-Holman Co. 52
San Francisco MArket 1-8474
Los Angeles ORegon 8-8981
Salt Lake City: J. R. Christensen EMpire 3-4419
Seattle: F. C. Scharr ATwater 2-9230
Portland: Clay Barton CApitol 8-3520

Southern California Edison Co. 50
Los Angeles MAdison 4-7111

Southern States Equipment Corp. 9, 93
Seattle: Jos. C. Platt MAin 3-6141
Salt Lake City: H. Lee Rawlings Co. ELgin 9-8811
Denver: R. T. Lewis Co. EAst 2-1082
Los Angeles: W. E. Kirk Co. MAdison 4-3651
Portland: C. F. Selby NEptune 6-6442
Oakland: John H. Ormond TWinoaks 3-3235

Square D Co. 119
Los Angeles CApitol 1-1171
San Francisco JUniper 7-4590
Seattle EAst 3-1474
Portland BElmont 4-8488
Denver KEystone 4-6234
Salt Lake City DAvis 2-5859
Phoenix ALpine 8-6448
El Paso KEystone 3-0544
Spokane FAirfax 8-3690
San Diego BElmont 3-7621
Fresno AMherst 8-6268

Superior Cable Corp. 128
Maydwell & Hartzell, Inc., in following cities:
San Francisco ATwater 8-6900
Los Angeles MAdison 8-7245
Phoenix ALpine 2-5858
Portland CApitol 8-4173
Seattle MAin 4-2368
Spokane MAdison 4-3285

Thomas Industries, Inc.
Lighting Fixture Div. 51
Los Angeles RAymond 3-6281
San Francisco JUno 3-5829
Denver DUdley 8-2845
Bellevue ELgin 1-6617

Triangle Conduit & Cable Co. 34
San Francisco UNderhill 3-6260
Los Angeles RAymond 3-3687
Seattle MUtual 2-3971
Denver SPruce 7-2375

Virden Lighting,,
Division of John C. Virden Co. 40
Atherton, Calif.: W. G. Sawyer DAvenport 5-4931
Fullerton: Wm. K. Newell TRojan 1-1845
Phoenix: Ray E. Wendling ALpine 2-2541
Seattle: Donald S. Gleason LAkeview 5-5151
Portland: Clyde E. Dodd BUtler 5-3271

Western Insulated Wire Co. 118
Los Angeles LUdlow 7-7103
San Francisco: Curry Co. YUkon 2-0788
Seattle: J. H. Stumph Co. MUtual 2-5232
Albuquerque: John Carder CHapel 2-3581
Salt Lake City:
John Carder Jr. Co. INgersoll 6-2461
Portland: George M. Roth CApitol 7-5654

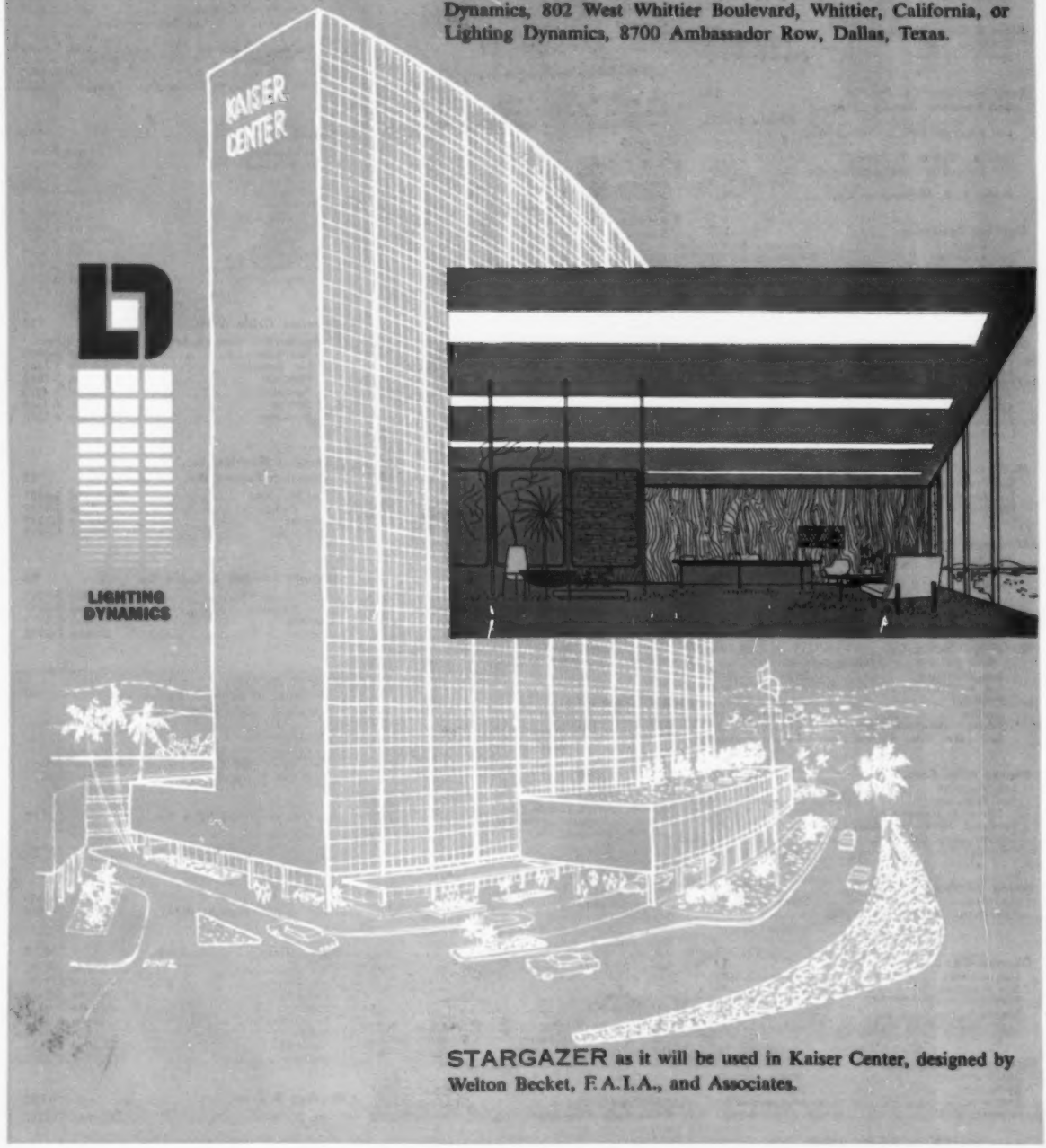
Westinghouse Electric Corp. 4, 5
San Francisco EXbrook 2-5353
Los Angeles MAdison 6-3881
Denver KEystone 4-8121
Phoenix ALpine 8-8621
Salt Lake City ELgin 5-3413
Seattle MAin 2-0808
Portland CApitol 2-9151
Spokane FAirfax 8-3371

Wrathall & Krusi, Inc. 126
San Francisco EXbrook 7-3593

problem solution

A recessed troffer with half-inch aluminum louvers was needed for Welton Becket's striking modular lighting plan for the offices in the spectacular 28-story Kaiser Center in Oakland, California.

STARGAZER with a distinctive half-inch aluminum louver was developed at Lighting Dynamics especially for Kaiser Center. Stargazer matches the fine detailing and integrates perfectly with the radiant acoustical ceiling. Now Stargazer is available for other advanced applications. It's easily installed—just pushes-up-and-clips. It has a shallow design; and is surprisingly inexpensive . . . comes in a variety of widths and lengths. Durable, Bonderized, and electrostatic, high reflectance finishes. FOR MORE COMPLETE INFORMATION, call your Lighting Dynamics representative, or write to Lighting Dynamics, 802 West Whittier Boulevard, Whittier, California, or Lighting Dynamics, 8700 Ambassador Row, Dallas, Texas.



STARGAZER as it will be used in Kaiser Center, designed by Welton Becket, F.A.I.A., and Associates.

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COSTS

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- No special skills or training needed!

300-watt G-1501 Generator,
5-gallon NT-1505 Tank
Other models from $175
2-year guarantee on all units

$695

Cleaning meters and demand registers the old-fashioned way requires tedious, expensive disassembly... individual cleaning of each part . . . and finally, reassembly. It all adds up to labor costs as high as $9 or $10 per register—unless you use a Narda SonBlaster! Then, it's more like $1 per register, and this figure comes from an actual user.

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How's it done? Merely fill the tank with solvent, flip the switch, and submerge your complete assembly. In minutes...seconds...every shaft, gear, bearing and part is meticulously clean! And with no physical labor!

Join the dozens of utilities now using Narda SonBlaster. We'll be glad to give you facts and figures to show how *you* can start saving *immediately* on cleaning meter registers, timing devices, and instruments in general. Write us, outlining your problem. Address: Dept. EWt-3.

More SonBlasters sold than all other ultrasonic cleaners combined!

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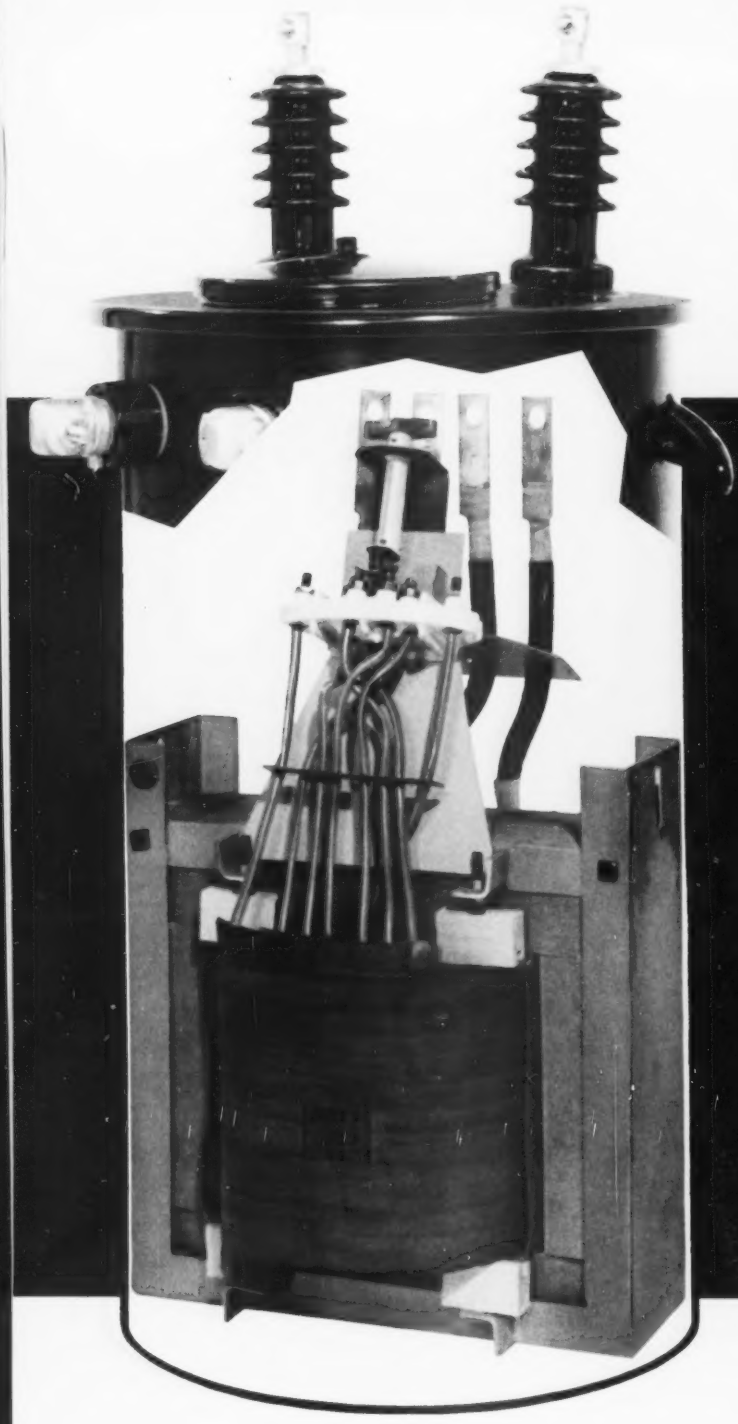

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